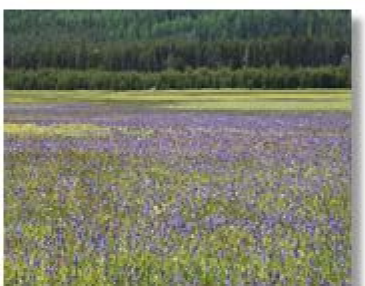
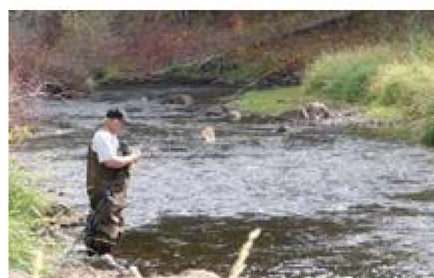
United States Department of Agriculture

Umatilla National Forest Land Management Plan





Forest Service Pacific Northwest Region 2018

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Land Management Plan
for the
Umatilla National Forest

Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties, Oregon
and
Asotin, Columbia, Garfield, and Walla Walla Counties, Washington

Lead Agency:	**USDA Forest Service**	
Cooperating Agencies:	Grant County, Oregon Morrow County, Oregon Umatilla County, Oregon Union County, Oregon Wallowa County, Oregon	Wheeler County, Oregon Asotin County, Washington Columbia County, Washington Garfield County, Washington Walla Walla County, Washington
Other Governments Involved:	Nez Perce Tribe Confederated Tribes of the Umatilla Indian Reservation Confederated Tribes of the Warm Springs Reservation	State of Oregon State of Washington
Responsible Official:	Jim Peña, Regional Forester USDA Forest Service, Pacific Northwest Region 1220 SW 3rd Avenue Portland, OR 97208	
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Websites:	https://www.fs.usda.gov/goto/BlueMtnsPlanRevision http://www.fs.usda.gov/main/umatilla/home.	

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Introduction

The mission of the United States Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. The Forest Service motto, “Caring for the Land and Serving People,” reflects the agency mission to achieve quality land management for natural resources on the land, and to meet the diverse needs of people under the sustainable, multiple-use management concept. The Umatilla National Forest Land Management Plan was developed in conjunction with two other national forests (the Wallowa-Whitman and Malheur National Forests), also located in the Blue Mountains; thus, readers will see references made to the Blue Mountains region. This Land Management Plan focuses on two areas: a larger analysis area (that of the three national forests), and the Plan Area (Umatilla National Forest).

Purpose of the Land Management Plan

This Land Management Plan (also referred to as the “Forest Plan” or “Plan”) is a guide for the future management of resources on the Umatilla National Forest for the plan period of approximately 10 to 15 years. This Forest Plan:

- Is strategic in nature. It does not include project-level or activity decisions. Those decisions are made later, when site-specific proposed actions are made and detailed analysis with further public involvement is completed, in accordance with the National Environmental Policy Act (1969);
- Is adaptive, in that new knowledge and information can be analyzed and the Forest Plan can be amended, if appropriate, at any time;
- Honors the continuing validity of private, statutory, or preexisting rights.

The accompanying Final Environmental Impact Statement to this Forest Plan analyzes potential impacts from stated goals and desired ecological, social, and economic conditions of the Umatilla National Forest and direction that focuses management activities toward maintaining or achieving those conditions. The goals and desired conditions in this Forest Plan are designed to contribute to the sustainable stewardship of the nation’s National Forest System, to contribute to local communities, and to meet the Forest Service’s responsibility to American Indian Tribes in relation to trust responsibilities and treaty resources.

Forest Plan guidance for the management of natural resources is intended to maintain and restore ecosystems while providing a predictable flow of forest products and uses to the public during the life of the Forest Plan. The goal of the Forest Service in planning is to contribute to meeting the needs of present generations without compromising the ability to meet the needs of future generations.

The multiple-use desired conditions and objectives, design criteria (standards and guidelines), and monitoring all work together to define management direction for national forests. Successful implementation of management direction and the rate of accomplishment for desired conditions are dependent upon the congressional budget process and other factors.

This Forest Plan and the attached appendices:

- Provide programmatic guidance;
- Provide a foundation such that decisions can be made on the Umatilla National Forest for subsequent proposed project-level actions, following public involvement and detailed analyses;
- Provide a context for future, project-level planning;
- Identify strategies for maintaining or achieving desired conditions and objectives;
- Identify land areas as generally suitable or unsuitable for various uses;
- Identify standards and guidelines to guide project and activity planning and implementation;
- Identify areas with special or unique characteristics;
- Provide monitoring and evaluation requirements; and
- Emphasize the use of best available scientific information and adaptive management.

Legal Framework

Over time, a framework of laws, regulation, and guiding legislation has been enacted that works to guide the management of National Forest System lands. Legal mandates governing national forest management date back to the Organic Act of 1897, which provided that national forests would be managed for the dual purpose of protecting water flows and providing a continuous supply of timber for the American public. The Multiple Use Sustained Yield Act (1960) provides:

1. For sustainability of multiple uses of natural resources in ways that best meet the needs of the public
2. While maintaining long-term productivity of the land for multiple uses
3. In such a manner that the lands are available to future generations.

The National Forest Management Act of 1976 and its accompanying regulations guide the creation, revision, and amendment of national forest land management plans, and the Forest and Rangeland Renewable Resources Planning Act of 1974 directs that the suitability of lands for resource management be identified and a process for the revision of land and resource management plans[1] established. This revision process was conducted under the legal framework of the National Forest Management Act and the provisions of the 1982 Planning Rule, as provided by the 2012 Planning Rule language (36 CFR 219.17(b)(3)). The National Forest Management Act requires forest plans to be revised at least every 10 to 15 years or sooner if warranted by changed conditions.

The National Environmental Policy Act (1969) requires that all major Federal actions significantly affecting the human environment be analyzed by government agencies in an appropriate environmental analysis document (such as environmental impact statements, environmental assessments, or categorical exclusions, as appropriate). The regulations further require that analyses should include both beneficial and adverse consequences affecting the quality of the human environment from proposed management actions and that supporting surveys or published studies, if needed, be referenced in the document analyses. Laws to be considered during the development of the environmental analysis documents include, but are not limited to: the Wilderness Act (1964), the National Historic Preservation Act (1966), the Wild

[1] Note the term “land and resource management plan” comes from the 1982 Planning Rule. The term has been revised to “land management plan” in the 2012 Planning Rule (see the transition provisions at 36 CFR 219.17 (b)(3)

and Scenic Rivers Act (1968), the Endangered Species Act (1973), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act (1990), as well as the Federal Water Pollution Control Act (1972) which is now known as the Clean Water Act, and the Clean Air Act (1977).

The Forest Service will, through this Forest Plan, continue to honor American Indian reserved treaty rights through consultation and coordination, and will maintain the government-to-government relationship with federally recognized tribal governments.

Other direction for managing National Forest System lands comes from a variety of sources, including Executive Orders, the Code of Federal Regulations, and the Forest Service directive system which includes the Forest Service Manual and the Forest Service Handbook. Management direction from the Code of Federal Regulations, the Forest Service Manual, and the Forest Service Handbook is generally not repeated in the Forest Plan.

Best Available Science

What constitutes best available science can vary over time and across scientific disciplines. The Forest Service demonstrates consideration for the best available science when acknowledging the use of a method, study findings, or other scientific results through discussions and analyses included in a project environmental analysis document. Specifically, the environmental analysis document should identify methods used, reference scientific sources relied on, discuss responsible opposing views, and disclose incomplete or unavailable information, scientific uncertainty, and risk.[2]

The Forest Service has a long history of science-based decisionmaking. Using scientific information in planning provides the responsible official with the knowledge, methods, and expert review needed to make an informed decision. To ensure that land management planning decisions help contribute to sustainable stewardship and ecological integrity of the national forest, the Forest Service also considers the best available scientific information pertaining to the economic and social conditions and composition, structure, and function of the ecosystems in the Forest Plan. In addition to other research, the scientific studies conducted by the Interior Columbia Basin Ecosystem Management Project (Quigley et al. 1996, Quigley and Arbelbide 1997) were incorporated in the development of this Forest Plan following the direction provided in an interagency memorandum signed April 18, 2014 by Deputy Regional Foresters in Forest Service Regions 1, 4, and 6; Bureau of Land Management State Directors in Oregon, Washington and Idaho; Environmental Protection Agency Region 10; Fish and Wildlife Service Pacific Region; and National Oceanic and Atmospheric Administration Fisheries West Coast Region. The memorandum is formally titled “The Interior Columbia Basin Strategy.”

The Citizen’s Guide to National Forest Planning (2016) states the best available science is…

> “…high-quality information that results from well-developed and appropriate methods, draws logical conclusions based on reasonable assumptions, explains information gaps and inconsistencies, has been appropriately peer-reviewed, is placed in the proper context within the body of knowledge, and cites references. However, not all information needs to meet all of these characteristics to be considered best available scientific information. At a minimum, scientific information needs to be available, accurate, reliable, and relevant. “Available” means that the Forest Service does not need to create new scientific information and conduct new research, but simply should use information that currently exists.”

[2] See 40 CFR 1502.9 (b), 1502.22, and 1502.24.

Organization of the Forest Plan

This Plan is organized into four parts: Part 1—Vision; Part 2—Strategy; Part 3—Design Criteria and Part 4—Monitoring and Evaluation Plan. In addition, each part includes both “plan components” and “other content.” The parts of the Plan and their associated plan components are described below.

Part 1—Vision

This part of the document provides the context for managing the Umatilla National Forest. The vision section describes:

- **National forest roles and contributions:** This section describes the roles, contributions, and setting that National Forest System lands provide to Tribes, local communities, the States, and the Nation.
- **Management challenges:** This section describes the challenges Forest Service managers face while striving to achieve or maintain the goals and desired conditions.

The plan components for Part 1—Vision include goals and desired conditions.

Part 2—Strategy

The strategy section describes how management activities will be conducted within the Umatilla National Forest to make progress toward achieving or maintaining the goals and desired conditions. It includes management areas and special areas, suitable uses and activities, and objectives. The other element included in Part 2 is:

- **Management focus**: This section describes how the goals, desired conditions and objectives may be applied to guide development of projects and activities on the Umatilla. These priorities do not limit activities to those types of areas identified, but guide decisionmakers to focus activities primarily in those areas with the greatest need for maintenance and restoration.

The plan components for Part 2—Strategy include objectives, management areas and special areas, and suitable uses and activities.

Part 3—Design Criteria

The design criteria provide the parameters for how future, site-specific activities can occur within the context of the Forest Plan. This includes the standards and guidelines. Design criteria may also include references to other applicable guidance, such as laws and regulations already in place that are not necessarily repeated in this plan.

The plan components for Part 3—Design Criteria include standards and guidelines.

Part 4—Monitoring and Evaluation Plan

Monitoring is part of an adaptive management process that measures Forest Plan implementation performance against Forest Plan goals, desired conditions, and objectives. Monitoring also evaluates whether standard and guideline implementation is producing the desired results.

Forest Plan Components

Plan components include goals, desired conditions, standards, guidelines, objectives, special areas, management areas, and suitable uses and activities. The Forest Service uses plan components to guide future project and activity decisionmaking. In contrast, other plan content provides information, background, and context for plan components. For reference, the following lists of plan components and other content of the Forest Plan identifies where in the Forest Plan this content is located:

Plan Components

- Goals and Desired Conditions (Part 1)
- Objectives (Part 2)
- Management Areas (Part 2)
- Special Areas (Part 2)
- Suitable Uses and Activities (Part 2)
- Standards and Guidelines (Part 3)

Other Plan Content

- Roles and Contributions of the National Forests in the Blue Mountains (Part 1)
- Management Challenges (Part 1)
- Management Focus (Part 2)
- Monitoring and Evaluation (Part 4)
- Summary of the Analysis of the Management Situation
- References and Appendices

Plan components are defined as follows:

Goals set forth a broad framework and theme for the Plan and form the basis for desired conditions. For each goal, there are several desired condition statements that more specifically describe what conditions are needed to attain the goals.

Desired conditions describe the conditions of what the Plan Area (or portions thereof) should look like in the future and what goods and services are desired. The Plan Area for this Forest Plan is the area included in the Umatilla National Forest.

Desired conditions essentially set forth the desired landscape of the future. Desired conditions also provide the foundation and drive the development of most other plan components. For example, the Forest Plan includes objectives, standards, and guidelines that are designed to achieve or maintain desired conditions.

Achieving desired conditions will vary in both time and scale. Some desired conditions may be achievable over a long timeframe (over 20 years, and in some cases, over 100 years); whereas, in other cases, the desired condition already matches the current condition, and the desire is to maintain it. In addition, each desired condition has a scale. Some desired conditions apply at the forestwide scale, while others apply at a subbasin, watershed, subwatershed, or management area scale. Desired conditions are timeless in that there is no specific date by which they are to be completed. The expectation is that the Umatilla National Forest staff will make progress toward achieving desired conditions but some desired conditions may not be achieved during the life of the Plan.

Desired conditions are organized under ecological, social, and economic conditions. In addition, each management area includes a desired condition statement related to the purpose for that management area.

Desired conditions may apply at a forestwide, subbasin, watershed or subwatershed scale. A subbasin refers to a 4th-level Hydrologic Unit Code (HUC08), which averages about 900,000 acres in size in northeast Oregon. Subbasins are divided into watersheds (HUC10) that average about 110,000 acres. Subwatersheds (HUC12) are subdivisions of watersheds that range in size from 10,000 to 20,000 acres.

Desired conditions were developed based on interdisciplinary team analysis informed by estimates of the historical range of variability as well as public input. In addition, other sources were used to develop desired conditions, including: National Fire Regime Condition Class information, modeling outputs from the Vegetation Dynamics Development Tool (ESSA Technologies Ltd. 2007), and National Landfire Modeling.

Objectives are a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving desired conditions. Objectives represent some of the expected outcomes for the Umatilla National Forest to make progress towards desired conditions.

Variation in achieving objectives may occur during the life of the Plan because of changes in environmental conditions, available budgets, and other factors. Influences on objectives include recent trends, past experiences, anticipated staffing levels, and budget projections.

Standards are mandatory constraints upon project and activity decisionmaking. They are established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Guidelines are a constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements. Guidelines serve the same purpose as standards but they differ in that they provide flexibility in defining compliance, while standards are absolute constraints.

Management areas are spatially distinct areas with a unique set of plan components. The management areas range along a continuum from little development in MA 1A to extensive development in MA 5. The types of uses and desired conditions in a management area define the land use that would occur in them under the Forest Plan. Management areas occur across districts, mountain ranges, and ecosystems but have commonalities that make their overarching land uses similar. Management areas are described in detail in Part 2—Strategy.

Special areas are lands that have designations by Congress or another delegated authority. Special areas are designated because of their unique or special characteristics. Special area establishment may occur at the national level through legislation (congressional designation) or at the regional or local level through administrative action (administrative designation). The Forest Plan may recommend the establishment of new special areas. This Forest Plan provides direction for the following special areas: scenic byways and All-American roads, national designated trails, eligible and suitable wild and scenic rivers, scenic areas, botanical areas, geological areas, historical areas, experimental forests and rangelands, research natural areas, as well as

recommended and designated wilderness. Special areas are described in detail in Part 2—Strategy.

Suitability describes the appropriateness of applying certain resource management practices or uses to a particular area of land. A unit of land may or may not be suitable for a variety of individual or combined uses. Identifying suitability helps determine if future projects and activities on that unit of land are consistent with desired conditions. Not all anticipated projects and activities have suitability designations in the Forest Plan. For some resources, identifying the suitability of use or activity in a particular area may be more appropriately made at the project or activity level with site-specific analysis, stakeholder participation, and proposed design criteria.

Monitoring and evaluation forms the basis for continuous improvement of the Forest Plan and provides information for adaptive management in the Plan Area. The Plan's monitoring program consists of a set of monitoring questions and associated indicators to evaluate whether plan components are effective and appropriate. Monitoring and evaluation also help to determine whether management is effective in maintaining or achieving progress towards desired conditions and objectives for the Plan Area. Biennial evaluations use the Plan Area monitoring to help the Umatilla National Forest staff determine if and where changes are needed in plan components, other plan content, and projects and activities. For monitoring, the staff may develop a variety of partnerships to collect data and conduct evaluations. Monitoring plans are constrained by fiscal and technical capabilities.

Consistency with Plan Components

Project or Activity Consistency with Applicable Forest Plan Components

As required by National Forest Management Act, all projects and activities authorized by the Forest Service must be consistent with the Forest Plan (16 USC 1604 (i)). Projects and activities authorized after the record of decision for this Forest Plan must be consistent with the applicable plan components. A project or activity approval document must describe consistency with the Forest Plan based on the following criteria:

1. Goals, desired conditions, and objectives: The project or activity contributes to the maintenance or attainment of one or more goals, desired conditions, or objectives, or does not foreclose the opportunity to maintain or achieve goals, desired conditions, or objectives, over the long term.
2. Standards: The project or activity complies with applicable standards.
3. Guidelines: The project or activity (a) complies with applicable guidelines as set out in the Forest Plan; or (b) is designed in a way that is as effective in achieving the purpose of the applicable guidelines.
4. Suitability: A project or activity may occur in a management area: (a) that the Plan identifies as generally suitable for that type of project or activity (see Table 31: Suitability matrix for management areas); or (b) for which the Plan is silent with respect to its suitability for that type of project or activity. In the second case, the responsible official would need to determine and document that the use is appropriate for the location.

   The effect of identifying lands as suitable for a use is notably different from identifying lands as not suitable for a use. The difference is as follows:

   - **Lands identified as suitable for certain uses or activities:** The Forest Plan's identification of certain lands as suitable for a use is not a commitment to allow such

use but only an indication that the use might be appropriate. A specific use or activity may be approved or may be disapproved in an area identified as suitable for such types of use.

- **Lands specified as not suitable for certain uses or activities:** If the Forest Plan identifies certain lands as not suitable for a use, then that use or activity may not be authorized, except by amending the Plan. Public uses for which a special use authorization is not required, such as biking, boating, camping, hiking, or hunting, will not be affected by such a designation in the Plan; such uses can be restricted only by an action such as a closure order.

A project with the purpose of timber production is unique in that it may occur only in a management area identified as suitable for timber production [16 U.S.C. 1604(k)]. Timber harvest for purposes other than timber production may be used in management areas where identified as a suitable tool to assist in achieving or maintaining one or more applicable desired conditions or objectives of the Plan, to protect other multiple-use values, and for salvage, sanitation, or public health or safety. Examples of using timber harvest to protect other multiple-use values may include improving wildlife or fish habitat, thinning to reduce fire risk, or restoring meadow or savanna ecosystems overgrown by trees.

The project or activity documentation should explain how the project or activity is consistent with applicable desired conditions and describe any short term or negligible long term adverse effects the project or activity may have concerning the maintenance or attainment of any desired condition.

It is not expected that all projects or activities will contribute to all desired conditions and objectives, but rather to a limited subset. It should also be recognized that some projects designed to contribute to some goals, desired conditions and objectives may have consequences considered adverse to the achievement of other desired conditions and objectives. In this situation, the responsible official needs to identify and disclose those effects and determine whether those effects will foreclose the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the long term. If the project or activity is found to foreclose opportunities to maintain or achieve any goals, desired conditions, or objectives over the long term, it is not considered consistent with the Forest Plan.

Project or Activity Inconsistency with Applicable Plan Components

Where a proposed project or activity would not be consistent with applicable plan components, the responsible official has the following options:

1. Modify the project proposal to make the project or activity consistent with applicable plan components;
2. Reject the proposal or terminate the project or activity;
3. Amend the Plan so that the project or activity will be consistent with the Plan as amended; or
4. Amend the Plan simultaneously with the approval of the project or activity so that the project or activity will be consistent with the Forest Plan as amended. The amendment may be limited to apply only to the project or activity.

Refer to the procedures for amending a Forest Plan at 36 CFR 219.13 (2012 Planning Rule), as amended.

Part 1 – Vision

This section describes background information, existing conditions, desired conditions, scale, and the roles and contributions made by the Umatilla National Forest at the local, regional, and national levels. The plan revision team engaged in a collaborative effort that included participation from Tribal, State, county, and local governments, plus a diverse array of public interest groups and nonprofit organizations. Many concepts, research studies, issues, goals, objectives, and strategies were reviewed.

National forests provide clean air and water, productive soils, diverse habitats, recreational opportunities, cultural benefits, quality jobs, and products that support traditional uses, communities, and economies at local, regional, and national levels. The vision for the Umatilla National Forest is to maintain and restore healthy forests, landscapes, and watersheds.

The vision was developed by integrating that information with the Forest Service mission, the need for change, the current management situation, and the best available scientific information that was considered relevant for the Umatilla National Forest.

The Forest Service vision recognizes the historic role that the Umatilla National Forest has played in shaping the local and regional environment of the Blue Mountains cultures, customs, and economies. It also recognizes that the management of the national forests has changed in the last several decades and will continue to change due to a variety of factors. These factors include, but are not limited to: natural disturbance (wildfire, insects, and disease), climate change, and changing public demands.

People are a part of the ecology and sustainability of the Blue Mountains and the Umatilla National Forest, as producers, distributers, users and stewards. People add complexity and are essential to the vitality and sustainability of the system.

The vision acknowledges that the Umatilla National Forest may have areas of unsustainable stand structures, densities, and species composition that compromise habitats for all living organisms. Forest conditions are such that human intervention is needed to reduce fuels, decrease stand densities, and restore streams (among other activities), which when completed will move the ecological, social, and economic systems toward the desired vision and sustainability.

Geographical Location

The 1.4-million-acre Umatilla National Forest straddles the Oregon-Washington border and is part of the Blue Mountains region, which also consists of the Malheur (and a portion of the Ochoco administered by the Malheur), and Wallowa-Whitman National Forests. These three national forests include approximately 5.5 million acres in northeastern Oregon, southeastern Washington, and western Idaho (Figure 1). The majority of the acreage (5.1 million acres) is in Oregon, with about 310,000 acres in Washington, and the remaining 160,000 acres in western Idaho.

The Umatilla National Forest is the northern-most national forest in the Blue Mountains (Figure 2) and is administered from Pendleton, Oregon. Ranger district offices are located in Pomeroy and Walla Walla, Washington and Heppner and Ukiah, Oregon. The web address for the Umatilla National Forest website is: http://www.fs.usda.gov/main/umatilla/home.

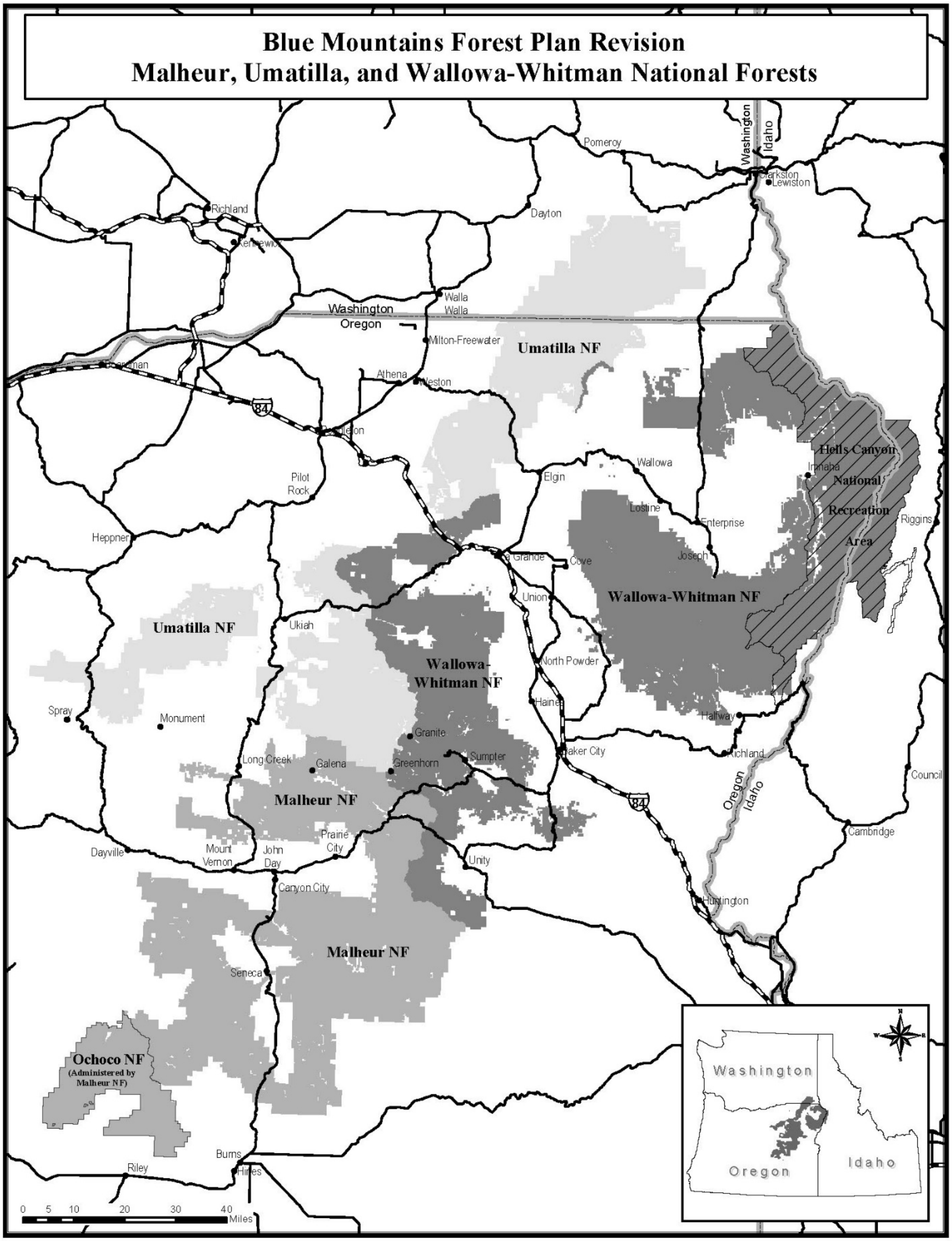


Figure 1. Vicinity map of the national forests in the Blue Mountains

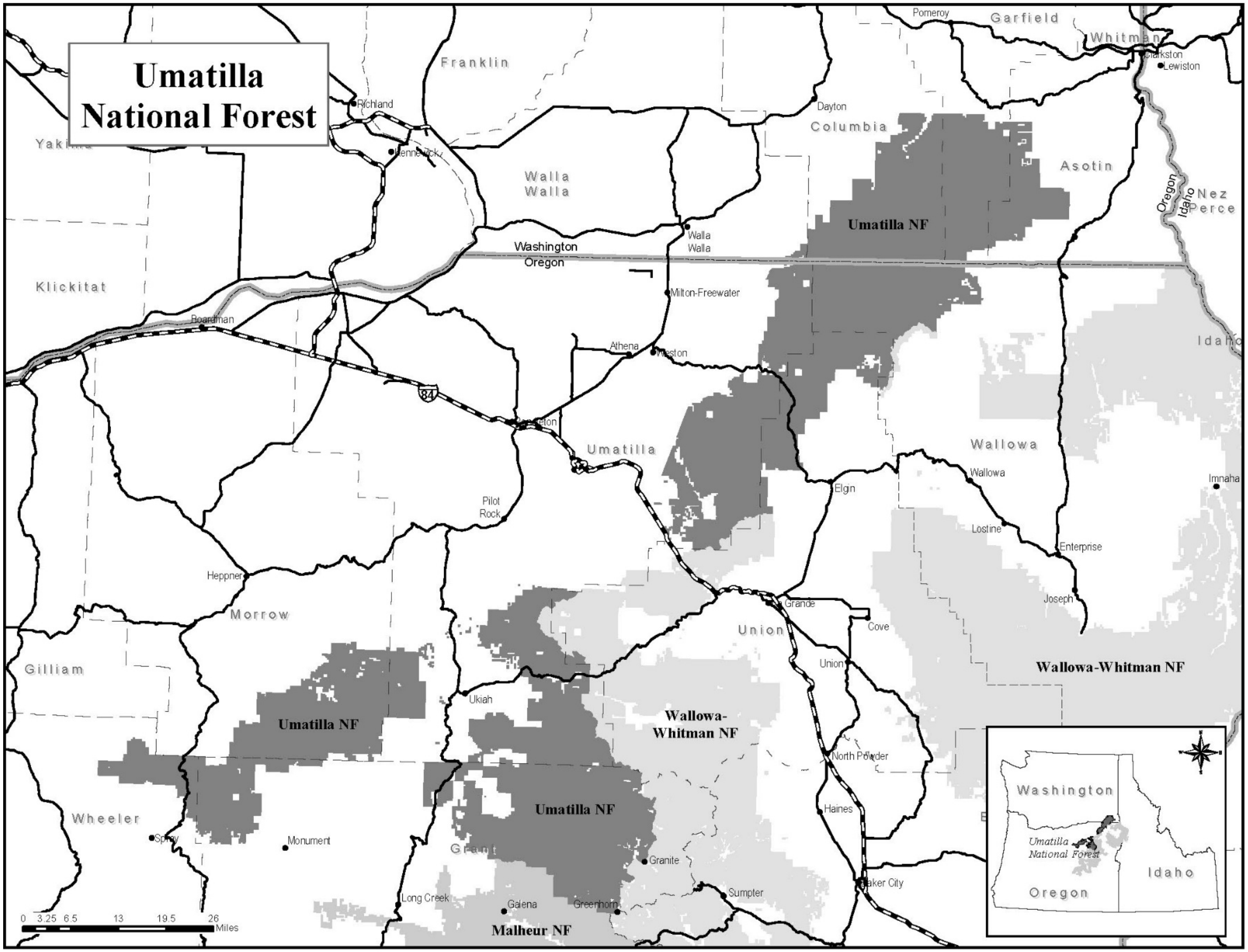


Figure 2. The Umatilla National Forest

Roles and Contributions of the National Forests in the Blue Mountains

Looking at national forest management at the scale of the Blue Mountains region provides an opportunity to coordinate strategic management direction that is common to each of the national forests of the Blue Mountains; and to define management direction that is distinct for each national forest. Forest plan components including desired conditions, goals, standards, guidelines, and objectives are generally the same for each of the national forests, and therefore are often described at the scale of the Blue Mountains region. Similarly, management areas were designed to provide a common means of displaying management intent, improving consistency across the three national forests along shared boundaries.

References to the Blue Mountains region can be found throughout this Forest Plan, supporting the concept of integrated forest management across national forest boundaries and promoting improved service for those who use and visit the national forests of the Blue Mountains. The individual forest plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests integrate similar plan components where practical and appropriate to improve management, administration, and implementation consistency across the Blue Mountains region. There are also important differences in the three forest plans in response to differences in resource conditions and local communities.

The highly diverse natural resources of the national forests in the Blue Mountains serve many important ecological, social, and economic functions. This section highlights some of the unique roles and characteristics that the national forests contribute to the local area, State, region, and nation; describes emerging challenges that national forest managers face; and outlines the vision of the national forests. The descriptions are not intended to be comprehensive. Additional information is available in the planning record and the Final Environmental Impact Statement.

Unique Physical and Biological Characteristics

The complex geological history of the Blue Mountains region, including floods, volcanic eruptions, landslides, and erosion, has shaped the landscape into a unique combination of landforms and vegetative patterns. The Blue Mountains region contains deep river canyons layered with gently sloping upland benches that are vertically cut by steep, V-shaped drainages. The area is known for extreme variations in elevations that range from less than 2,000 feet at the bottom of Hells Canyon, the deepest gorge in North America, to nearly 10,000 feet at the top of the Wallowa Mountains in Oregon and the Seven Devils Mountains in Idaho. Rocky outcrops and high peaks of about 9,000 feet protrude along the backbone of the Strawberry, Aldrich, Elkhorn, Wallowa, and Wenaha Mountain ranges.

This combination of geology and topography produces a distinctive, mosaic pattern of dense, heavily forested slopes interspersed with open, rugged shrublands and grasslands. Deep volcanic ash soils contribute to productive forest stands, shrublands, and grasslands that provide forage and browse. Sparse, scattered stands of ponderosa pine and junipers dot areas of shallow, rocky soils. Additionally, the region has been an important producer of gold, silver, copper and has been a source of lesser amounts of lead, zinc, platinum, chromium, and other metals. It is also a potential source for geothermal energy.

The Blue Mountains region is situated at the extreme eastern edge of the Cascade Range’s rain shadow. This produces a combination of high-desert climate with hot, dry summers (less than 10 inches of precipitation per year) in the lower valleys with moist maritime conditions influenced

by the Columbia River at the higher elevations (more than 80 inches of precipitation per year). This variety of landform, elevation, and climate results in a diversity of plants within the watersheds that range from lower to higher elevations: juniper, sage, shrublands, ponderosa pine plant communities, mixed conifer, subalpine fir, Engelmann spruce stands, and alpine plants.

Unique plant communities occur throughout the Blue Mountains. Thirty research natural areas include other unique features, such as the bluebunch wheatgrass of the Pataha within the Umatilla National Forest.

The Blue Mountains provide habitat for more than 250 native wildlife species, including larger species, such as cougar, black bear, mountain goat, bighorn sheep, deer, pronghorn antelope, gray wolf, and elk, along with a host of smaller birds and animals, such as marten, mink, beaver, badger, bobcat, coyote, river otter, Clark's nutcracker, and ruffed and blue grouse. The national forests in the Blue Mountains provide an important corridor for many of these species between the Rocky Mountains and central Oregon.

The Blue Mountains are inhabited by one of the nation's largest herds of Rocky Mountain elk. Cooperative efforts to restore and protect Rocky Mountain elk, as well as bighorn sheep populations, are recognized regionally and nationally.

Streams, rivers, and lakes provide habitat for a variety of native anadromous and resident fish species. For example, the Imnaha and Grande Ronde River drainages provide the highest upstream spawning areas for Chinook salmon and steelhead trout on the Snake River in Oregon. The John Day River is the second longest undammed river (280 miles) in the contiguous United States and supports four different species of naturally reproducing, native salmonids.

Bull trout are federally listed as threatened across their range. Summer steelhead in the Middle Columbia River Basin and in the Lower Snake River Basin are also federally listed as threatened. Chinook salmon are federally listed in the Lower Snake River Basin region (portions of the Umatilla National Forest and all of the Wallowa-Whitman National Forest downstream of Hells Canyon dam complex). Chinook salmon are also present in the Middle Columbia River Basin portion of the Planning Area but are not federally listed in those subbasins (portions of all three national forests). Westslope cutthroat and inland redband are also important fish species within the Blue Mountains.

Social and Economic Characteristics

The Blue Mountains region has a rich and diverse cultural history of human habitation that spans more than 10,000 years. The three national forests are within the areas aboriginally occupied by several American Indian Tribes, and these Tribes maintain strong ties to each of the national forests, as the area plays a significant role in the life and culture of local and other Tribes. Numerous archaeological and historical resources existing within the national forests are important to American Indian Tribes. Other areas and activities of importance central to Tribes include gathering herbs and plants from traditional locations, traditional hunting and fishing sites, and other areas used for traditional uses. Habitat for fish and wildlife is also important to the American Indian Tribes.

Tribal members also continue to practice religious activities within the national forests. They find spiritual renewal in sacred areas. Activities depend on maintenance of healthy forests, shrublands, and grasslands across the Blue Mountains.

The national forests in the Blue Mountains have a long history of providing timber and other forest products to address local community and national needs. Until recently, communities

throughout the socio-economic impact zones had strong economic components related to the wood products industry. Increased environmental protection, a focus on sustaining and restoring a broader range of resources resulting in PACFISH, INFISH, and Eastside Screens protections, and changing mill technology have contributed to significant declines in the wood products industry and associated businesses. Annual timber volume harvested from the national forests in the Blue Mountains, excluding fuelwood, has declined dramatically since the last forest plans were prepared, from a high of over 600 million board feet in 1989-90 to about 80 million board feet in recent years. Harvest on other ownerships also declined over the same period.

A viable wood products industry helps maintain the local infrastructure, including roads, mills, and equipment, as well as retaining a skilled labor force, needed to carry out forest restoration activities. Wood processing capacity is important for several reasons. It generates value added jobs and income in addition to jobs associated with logging activities. Local processing capacity increases the net value of stumpage because it costs more to ship logs to distant mills. A higher stumpage value means forest restoration projects are more likely to be economically viable. Restoration activities create jobs and improve socio-economic well-being as they improve forest health.

The contributions associated with the timber harvested from the three national forests and their socio-economic impact zones from 2014-2016 averaged 415 jobs and $24,424,000 in labor income. For the Umatilla National Forest, the annual average was 137 jobs and $8,258,000.

Many historical uses of the national forests resonate today in the rural western culture of the area and continue to contribute to the economies of local communities. Historical sites visited today include remnants of the 1860s-gold rush in the John Day and Powder River country where remnants and remains of railroad logging and old company towns exist in numerous places.

Ranchers are permitted to graze cattle on specified allotments within the national forests during late spring, summer, and early fall. Fees collected from grazing contribute toward county receipts and are reinvested into range improvements.

The Blue Mountains encompass one of the most extensively mineralized areas in Oregon. Gold and other valuable minerals still exist beneath the land’s surface and are still available for prospecting in accordance with mining laws.

Residents and visitors alike seek out the national forests year-round for recreational opportunities. Activities range from seeking solitude in the backcountry to staying in developed campgrounds along travel corridors and more, including hunting, fishing, wildlife watching, rock climbing, hiking, off-highway vehicle use, whitewater rafting, and horseback riding. Hunters travel the national forests in search of elk, deer, and antelope during the appropriate season in the late summer and fall and in doing so contribute to local economies. The national forests also provide winter sports opportunities such as snowmobiling, cross-country, and downhill skiing.

The Umatilla National Forest provides areas with an undeveloped character and backcountry setting. With three designated wilderness areas and three wild and scenic rivers, the Umatilla offers a variety of diverse experiences. The Wenaha-Tucannon Wilderness displays a maze of deep, sheer-walled canyons that cut into what was once a flat and expansive plateau, creating long ridge tops and wide, forest-covered mesas that stand 2,000 feet above the drainage bottoms.

Exceptional scenic qualities are important features of the Blue Mountains. The beautifully rugged and remote Hells Canyon National Recreation Area comprises an exceptional richness and diversity of unique geology and vegetation that support a variety of fish and wildlife species. The

wild and scenic Snake River corridor provides outstanding scenic qualities, as well as important recreational boating and hiking opportunities. Other wild and scenic rivers, including the Grande Ronde, Malheur, and North Fork John Day Rivers and Eagle Creek, have outstanding features, such as unique history, critical fish habitat, and unusual geology.

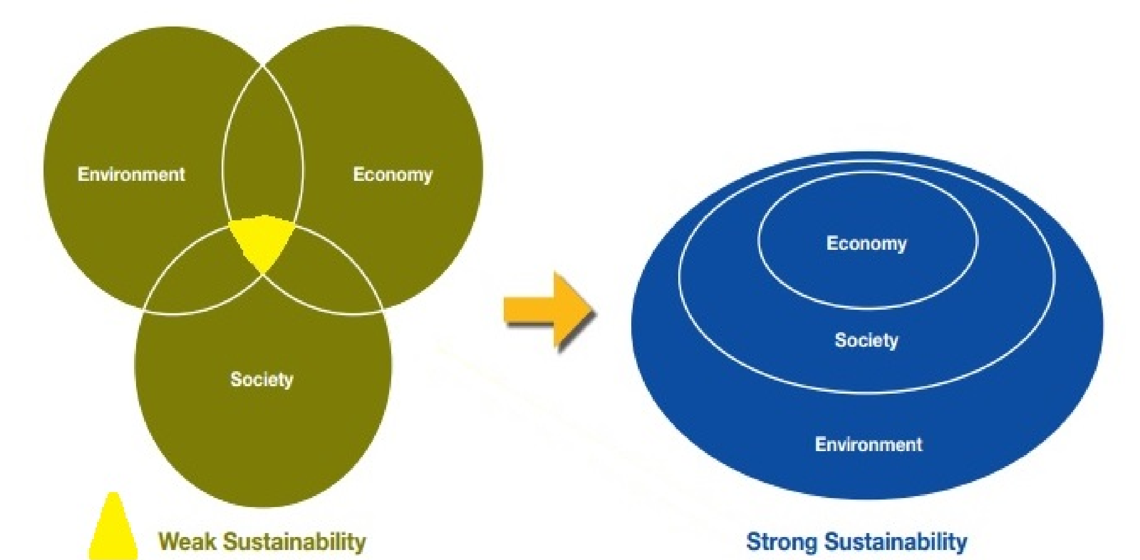
The Umatilla National Forest provides the backdrop to communities that value views and scenery. Several of the roads that provide access to the national forests are part of national, regional, and state scenic byways. Along the Hells Canyon, Blue Mountains, Elkhorn, or Journey through Time Scenic Byways, visitors and residents enjoy scenic panoramas of pastoral valleys, mountain vistas, and rolling uplands interspersed with steep river canyons. An abundance and variety of wildlife species may be seen, including bald eagles in the winter and bighorn sheep in the summer and fall. Remarkable scenery and solitude is available in many areas, including the Vinegar Hill-Indian Rock Scenic Area located along the border of the Malheur and Umatilla National Forests.

Management Challenges

Providing for the socially, economically, and ecologically sustainable management of the national forests is affected by a complex set of factors outlined in the Blue Mountains Forest Plan Revision Need for Change (USDA Forest Service 2005, updated 2010). Sustaining the values and contributions provided by the national forests depends on the ability to reconcile challenges to national forest and community sustainability. By achieving a set of integrated ecological, social, and economic goals and desired conditions, the three national forests are more likely to contribute to a broader range of sustainable and resilient ecosystems now and in the future.

The National Report on Sustainable Forests (USDA Forest Service 2010a) states that the Federal Government adopted an evolved understanding for the term sustainable after the extensive dialogue process followed the release of the 2003 National Report on Sustainable Forests (USDA Forest Service 2004). Prior thinking about sustainability (left side of Figure 3) envisioned the environmental, social, and economic realms as interconnected, yet separate, parts of a system. This is now considered a weak basis for sustainability. The recent understanding is that the environmental realm is the foundation of strong sustainability where social values and economic needs are interdependent with the environment (right side of Figure 3).

The National Report on Sustainable Forests (USDA Forest Service 2010a) states: “Human society cannot exist without the environment, which provides the basic necessities of life: air, water, food, energy, and raw materials. The human economy depends on people and social interaction. The core concept of strong sustainability is that the benefits of nature are irreplaceable and that the entire economy can be realized if the influences and interactions between economy, society, and ecology are properly accounted for.”



The graphic above, shown as Figure I-1 in the National Report on Sustainable Forests (USDS FS 2010a), refers to the *Triple Bottom Line: interconnected and interdependent benefits* between economy, society, and the environment. Source: Maureen Hart: Sustainable Measures

Figure 3. Concepts of weak sustainability compared to strong sustainability, where the environmental realm is the foundation of the strong sustainability scenario because it provides natural goods and services that cannot be obtained through any other means (USDA Forest Service 2010a)

Social and Economic Expectations

Management of public land involves conflicting desires, values, and preferences, depending upon which user or user-group is offering their input and which resource is being discussed. The public expects a diversity of uses from National Forest System lands. People frequently disagree about how national forests should be managed and many have interests and opinions that are often held strongly. It is important for the public to understand that the Forest Service is bound by many laws and regulations. There are many public participation processes where people can have their voices heard and where they can see their desires realized in the decision-making process. More about opportunities to partner with the Forest Service and on how to better understand the public law process, can be found at the following Forest Service website: https://www.fs.usda.gov/main/prc/home

Diverse Experiences

An increasing number of visitors (local, regional, and national) rely on the national forests for recreational opportunities and resource uses in ways that are not always compatible. Technological advances have changed the day-to-day activities of visitors and the way people recreate within the national forests. The increased popularity of motorized recreation has generated user conflicts between those seeking motorized experiences and those seeking solitude in their recreation experiences. New capabilities in other recreational equipment, such as mountain bikes, global positioning systems (GPS), recreational use of unmanned aircraft systems or "drones," over-snow vehicles, and off-highway vehicles allow people to experience the national forests in new and different ways.

Transportation System

Expanding road networks have created many opportunities for uses and activities within the national forests, including a wide range of recreational motorized use, firewood collection, hunting and fishing access, and berry picking. Vegetation and fire management are primarily accomplished using the road network. Conversely, road networks have dramatically altered the character of the landscape by increasing erosion and introducing sediment to stream systems, which can alter the stream channel, reduce aquatic productivity with subsequent impacts resulting in limiting the survival and growth of fish in the streams. Road networks also fragment habitat. Road use can displace animal populations and increase the spread of invasive species and noxious weeds. The cost of maintaining road networks and maintenance backlog also presents management challenges. The Forest Service must find an appropriate balance between the benefits and needs of access to the national forests and the costs of road-associated effects to social and ecosystem values.

Grazing

Livestock grazing (cattle and sheep) within the national forests supports traditional lifestyles and local economies. Grazing has the potential to impact National Forest System resource conditions, including, but not limited to, grasslands, shrublands, and riparian areas which may affect habitat necessary for terrestrial and aquatic animal species. Contact between permitted domestic sheep and bighorn sheep can lead to disease transmission, and may result in substantial impacts to bighorn sheep populations in the area.

Fire-adapted Ecosystems

Fire is a natural part and regular occurring disturbance of the ecosystem across the Blue Mountains region. A wide diversity of natural fire behavior has been exhibited historically throughout each of the three national forests. The cumulative effects of episodic, periodic and sometimes extended drought, increasing vegetative density, shifts in forested species composition, and otherwise modified landscape patterns have resulted in conditions at many locations that are outside the range of what is sustainable, given the regular fire occurrence across the national forests. These conditions may put the ecosystem at high risk of uncharacteristically large and severe fires and disturbances from insects and diseases. The potential for fires with uncharacteristically severe effects exists on approximately 60 percent of the national forests due to these changes in forest structure and composition. In addition, recent weather trends and long-range climate study predictions suggest there may be longer fire seasons and more severe fires. These conditions increase both the challenge and the motivation for restoring the landscape to reduce the severity of fires.

Approximately 20 percent of the Blue Mountains is considered wildland-urban interface: area where wildfire can pose a substantial threat to life and property. Firefighter safety and increasing large fire suppression costs are additional consequences and challenges for fire(s) that occur in an urban interface.

Invasive Species

Collaboration between the Forest Service, partners, and the public is important to manage the current challenge in ecosystem management of arresting the spread of invasive, undesirable, nonnative species (i.e., aquatic and terrestrial species), including insects and diseases. Increasingly, invasive species are displacing some native species and altering some ecosystem structures, composition, and function.

Natural vectors include, but are not limited to: wind, water, animals, and humans. Human induced sources from various forms of multiple use include public recreation both on water and land (i.e., boating, fishing, and on and off-highway vehicle use). Other sources include vehicular travel from an area infected with invasive species to another that is not, traveling with uncleaned equipment used in areas infected with invasive species, illegal dumping of yard wastes, or collecting, relocating, and discarding infected firewood.

Rapid response is important to address the prevention of new infestations of high priority invasive species, as well as to make progress in areas where control efforts and restoration and reclamation is possible. Invasive species have become well established in some areas and are difficult to eliminate, and some infestations could become more extensive.

Wildlife Habitat

The increase in dense, multi-story forest stands provides habitat conditions that sustain a variety of wildlife species at higher densities and in larger areas than possibly occurred when the national forests were dominated by more open forest conditions. The challenge is to balance the need to shift forest conditions toward more open and sustainable conditions with the need to continue to provide habitat for species that prefer the dense, multi-story conditions. An additional challenge is managing human (including management) activities around select road systems at a level that will not render the surrounding habitat unusable to wildlife due to human disturbance and the loss of snags resulting from firewood collection and hazard tree removal.

Old Forest

Open canopy old forest within the dry vegetation type has declined substantially from historical levels, and species that rely on this structural stage are declining (Wisdom et al. 2000). Although the status of some species associated with dense old forest multi-story may be increasing, the ecological processes are not sustainable. It will be a challenge to restore old forest while balancing the needs of species that rely on dense forests, especially when considering the moisture stress that has already occurred at some sites and climate change predictions for the future such as an increase in the severity of wildfires.

Watersheds and Aquatic Habitats

Watershed conditions in most areas of the Blue Mountains have been degraded to varying degrees by a long history of land use activities, including placer and lode mining, timber harvesting, livestock grazing, road construction, irrigated agriculture, water diversions, and other human uses. The impacts of these activities are still reflected in the condition of many watersheds today (McIntosh et al. 1994a, 1994b; Wissmar 2004; Lee et al. 1997). The extent and quality of aquatic habitats, as well as watershed and soil conditions, have been greatly reduced from historical conditions. As a result, populations of anadromous and resident fishes have declined (Gregory and Bisson 1997). Large declines in pool habitat, large wood, and aquatic habitat diversity have been noted in streams in the Blue Mountains (McIntosh et al. 1994a, 1994b). In addition, high road densities contribute sediment, alter riparian habitats, and increase the rate of watershed runoff. Access to more than 3,700 stream miles on the three national forests is blocked or partially blocked by culverts that were not originally designed for fish passage.

Many native fish populations are now limited to small portions of, or fragmented within, what were originally much larger, more continuous distributions for their species that span not only National Forest System lands but other ownerships as well (Young 1995, Lee et al. 1997). Other influences that have contributed to current habitat and population conditions include main stem

hydropower dam construction and operation, hatchery management, fishing regulation and harvest, and competition or hybridization with nonnative species. Population and habitat conditions, threats and trends throughout the range of each species at the time of listing were discussed in the Federal Register for several species of fish listed under the Endangered Species Act (57 FR 23458, June 3, 1992; 62 FR 43937, August 18, 1997; 63 FR 31647, June 10, 1998; 64 FR 14517, March 25, 1999). Current population statuses and trends for the listed species are periodically updated in agency status reviews or recovery plans for listed evolutionarily significant units and distinct population segments.

Many of the remaining strongest local populations, remnants of high-quality habitat and residual population networks for native aquatic species are often found on public lands, primarily in roadless areas, and are now key to the conservation of these species (Lee et al. 1997). Restoration of watershed and aquatic habitat conditions has been underway for decades but will require an increasingly more integrated approach to improve effectiveness. Restoration needs to address terrestrial, riparian, and aquatic habitats with multiple spatial scales and multiple ownerships. In some cases, improvements may not be seen for decades or centuries (Reeves et al. 1995). Habitat restoration by itself, is not a substitute for appropriate environmental protection. Management that relies solely on rehabilitation of altered habitats cannot sustainably provide for ecosystem health (Gregory and Bisson 1997; Wissmar et al. 1994a, 1994b).

Degraded habitat conditions and several other factors have contributed to the Federal listing of bull trout across their range; Chinook salmon (both fall and spring/summer) and steelhead in the Lower Snake River Basin; and summer steelhead in the Middle Columbia River Basin as threatened under the Endangered Species Act, and have resulted in listings of designated critical habitats for these species. Designated critical habitats for listed steelhead and salmon under the Endangered Species Act encompass all essential fish habitat for Pacific salmon species present in the Plan Area. The Magnuson-Stevens Fisheries Conservation and Management Act of 1996 requires consultations with National Marine Fisheries Service when federal land management may adversely impact essential fish habitat for commercial fish species, including Chinook salmon in the Plan Area, both federally listed and non-listed populations.

Water quality does not meet Oregon and Washington standards in more than 1,200 miles of stream on national forests in the Blue Mountains for a variety of reasons, and not all are related to management activities on National Forest System lands. Water quality limited stream segments occur in every major drainage in the Blue Mountains and are located on both private and public lands.

Water that flows from National Forest System lands is used downstream for drinking water, irrigation, and hydroelectric power generation, among other uses. Watershed restoration may have varying societal benefits, depending on geographic location, by improving water quality for downstream users, moderating flood flows, maintaining the quantity of water that flows from streams and rivers on National Forest System lands, reducing the amount of sediment that enters the streams, and adapting to expected climate change.

Climate Change

Average temperatures in the Pacific Northwest have increased by about 1 degree Celsius (1.8 degrees Fahrenheit) since 1900. The rate of warming during the last 50 years is nearly twice the rate of the previous 100 years (ISAB 2007). The rate of warming is expected to increase in the 21st century. Mean annual temperatures are expected to rise by 0.3 degrees Celsius (0.5 degrees Fahrenheit) per decade through 2050 in response to continued increases in atmospheric greenhouse gases (Mote et al. 2008). After 2050, projected temperature increases rely largely on

changes in greenhouse gas emissions from the present levels. Total temperature increases could exceed 3 degrees Celsius (5.3 degrees Fahrenheit), relative to the 1970-1999 average, by 2080-89 (Halofsky and Peterson 2017). Little change in precipitation is predicted, although model results vary from minus 10 percent to plus 20 percent change by 2080.

Other expected changes in the Pacific Northwest include:

- Higher temperatures will result in more winter precipitation falling as rain instead of snow.
- Low elevation snowpack may disappear completely; average snowpack is expected to decline by 53 to 65 percent by 2080-89.
- Winter precipitation is expected to increase slightly and summer precipitation is expected to decrease slightly.
- Increased winter and spring temperatures combined with decreased winter snowfall will exacerbate the current trend toward earlier spring runoff and lower late-season streamflow.
- Winter streamflow will be more variable with an increased likelihood of rain-on-snow floods.
- Increased risk of higher flood peaks as well as increased risk of extended droughts is expected.
- Lower summer streamflow and higher summer water temperatures will likely reduce available habitat for cold-water fish species (ISAB 2007) and alter disturbance regimes, including, but not limited to, increased frequency and patch-size of high severity fires and more frequent and widespread occurrences of forest insect and disease outbreaks.

Reductions in winter snowpack are already beginning to be reflected in earlier spring streamflow throughout the western United States (Dettinger 2005, and Hamlet et al. 2005), and this decline is expected to accelerate during this century. Continued warming in the Pacific Northwest is likely to result in increased water use by vegetation (Hamlet et al. 2007) that may result in stress to wildlife and humans induced by increased drought and reduced water availability. Changes in the timing of watershed runoff are expected to place increased stress on water supplies and water storage facilities throughout the Pacific Northwest. Redistribution of forested and non-forested habitats is expected, resulting in altered habitat conditions for most terrestrial wildlife species.

Predicted impacts from climate change are expected to affect species range and species composition and alter competitive relationships between plant species. Changes in the composition and structure of plant communities will, in turn, alter the character and distribution of wildlife habitats. Future conditions may be more favorable to some undesired nonnative plant and animal species. A recent climate change vulnerability assessment (Halofsky and Peterson 2017) provides important insights on natural resource response to the effects of climate change in the Blue Mountains region, including responses by water resources, fisheries, upland vegetation, and special habitats. Climate change adaptation strategies are also provided in the vulnerability report. Therefore, to maintain or increase the resilience of the national forests in the face of these changes, the findings and recommendations of the vulnerability assessment were incorporated into this Forest Plan as appropriate. Many of the implications of expected climate change are discussed in the individual resource sections in Part 1.

Considering Climate Change in Designing Plan Components

The development of plan components includes consideration of future effects from climate change. The following analysis should be considered for this entire Forest Plan, but to eliminate repetition, will not be repeated in each plan component description.

Some plan components have been modified or added to address information provided by an assessment of climate change vulnerability and adaptation in the Blue Mountains (Halofsky and Peterson 2017). The key climate change effects to natural resources that are predicted in Halofsky and Peterson (2017) include:

- Hydrology, Water Resources, and Infrastructure:
    - ♦ Decreased snowpack and earlier snowmelt will shift the timing and magnitude of streamflow;
    - ♦ Peak flows will be higher and summer low flows will be lower;
    - ♦ Decreasing snowpack and declining summer flows will alter timing and availability of water supplies affecting municipal and public uses downstream from and in national forests, and other forest uses including: livestock, wildlife, recreation, firefighting, road maintenance, and instream fishery flows; and
    - ♦ Increased magnitude of peak stream flows will damage roads near streams, ranging from minor erosion to complete loss of road.
- Fisheries:
    - ♦ Decreased snowpack will shift the timing of peak flows, decrease summer low flows, and in combination with higher air temperature, increase stream temperatures, all of which will reduce the vigor of cold water fish species; and
    - ♦ Abundance and distribution of spring Chinook salmon, redband trout, steelhead, and bull trout will be reduced.
- Upland Vegetation:
    - ♦ Increasing air temperature, through its influence on soil moisture, is expected to cause gradual changes in the abundance and distribution of tree, shrub, and grass species;
    - ♦ Drought-tolerant species will become more competitive;
    - ♦ Ecological disturbance, including wildfire and insect outbreaks, will be the primary facilitator of vegetation change;
    - ♦ Future forest landscapes may be dominated by younger age classes and smaller trees;
    - ♦ High-elevation forest types will be especially vulnerable to disturbance; and
    - ♦ Increased abundance and distribution of nonnative plant species will create additional competition for regeneration of native plant species.
- Special Habitats:
    - ♦ Riparian areas and wetlands will be especially vulnerable to higher air temperature, reduced snowpack, and altered hydrology;
    - ♦ Riparian areas and wetlands will experience decreased establishment, growth, and cover of species such as cottonwood, willow, and aspen; and

- Reduced groundwater discharge to groundwater-dependent ecosystems will reduce areas of saturated soil, convert perennial springs to ephemeral springs, eliminate some ephemeral springs, and alter local aquatic flora and fauna communities.

Halofsky and Peterson (2017) identified adaptation strategies and tactics to slow the rate of deleterious climate-related change to resource conditions in the Blue Mountains. The Forest Plan incorporates these strategies and tactics as follows (Table 1).

Table 1. Climate change tactics and strategies as identified in Climate Change Vulnerability and Adaptation in the Blue Mountains (and responsive plan approaches)

Climate Change Adaptation Strategy or Tactic	Examples of Plan Approaches that Address Climate Change Strategies and Tactics
Hydrology, Water Resources, and Infrastructure	
Restoring the function of watersheds, connecting floodplains, reducing drainage efficiency, maximizing valley storage.	The Blue Mountains Aquatic and Riparian Conservation Strategy (ARCS) has multiple Plan components (see Appendix A). The Blue Mountains ARCS has been integrated throughout the Plan.
Reducing fuels, fire hazards, and stand densities.	The primary focus of the Vegetation Management portion of the Plan addresses these strategies or tactics.
Increasing the resilience of stream crossings, culverts, and bridges to higher peak flows.	Plan components address these (desired conditions, standards and guidelines).
Facilitating response to higher peak flows by reducing the road system and disconnecting roads from streams.	General Plan approach as well as specific objectives.
Reduce adverse effect to watersheds by converting roads to alternative uses or decommissioning them.	General Plan approach as well as specific objectives.
Adding wood to streams, restoring beaver populations, modifying livestock management, and reducing surface fuels and forest stand densities.	The Blue Mountains ARCS has multiple Plan components (see Appendix A). The Blue Mountains ARCS has been integrated throughout the Plan.
Revising grazing practices.	The Blue Mountains ARCS grazing standards and guidelines are designed to improve riparian conditions.
Fisheries	
Maintaining or restoring natural flow regimes and decreasing fragmentation of stream networks.	Plan components address these (desired conditions, standards and guidelines), as do considerations for key and priority watersheds.
Developing unplanned use plans (for wildfire) that address sediment inputs and road failures.	Will be addressed during reviews or updates of Fire Management Plans.
Revegetating burned areas to store sediment and maintain channel geomorphology.	Desired condition plan component should guide Burned Area Emergency Rehabilitation plan.
Using watershed analysis to develop integrated actions for vegetation and hydrology.	Specific guideline from Blue Mountains ARCS.
Protecting groundwater and springs, restoring riparian areas and beaver populations, reconnecting and increasing off-channel habitat and refugia, and identifying and improving stream crossings that impede fish movement.	Plan components address these (desired conditions, standards and guidelines, and objectives).

Climate Change Adaptation Strategy or Tactic	Examples of Plan Approaches that Address Climate Change Strategies and Tactics
Upland Vegetation	
Increasing resilience to drought and ecological disturbance.	The primary focus of the Vegetation Management portion of the Plan addresses these strategies or tactics.
Managing landscapes (Stand density/fuel treatment/fuel continuity/reduce populations of nonnative species to reduce severity and patch size of fire/encouraging fires) to play a more natural role in the ecosystem.	Plan components address these (desired conditions, standards and guidelines, and objectives).
Revising grazing policies and practices.	Use of State and Transition Models identification of upland condition when prescribing allowable forage utilization levels.
Address special needs of rare and disjunct vegetative species communities.	Addressed with Botanical Area and Research Natural Area management area plan components and plan components for threatened, endangered, candidate, and sensitive plants.
Special Habitats	
Maintaining appropriate densities of native species.	Plan components address these (desired conditions, standards and guidelines, and objectives).
Restore natural flow regimes.	Consistent with Blue Mountains ARCS restoration-related plan components.
Reduce stresses of conifer encroachment, livestock grazing, and ungulate browsing.	Plan components address these (desired conditions, standards and guidelines).
Control nonnative species.	Plan components address these (desired conditions, standards and guidelines).

Goals and Desired Conditions

The goals and desired conditions are a set of interrelated and interdependent ecological, social, and economic conditions. The land and resources of the Plan Area are to be managed to achieve or maintain goals and desired conditions to allow the Umatilla National Forest to contribute to a range of outcomes now and in the future. This emphasis on integration of the goals and desired conditions promotes an adaptive and active management philosophy, as the Forest Service collaborates with the public and works with partners to accomplish the vision for the Blue Mountains region. Goals and desired conditions are a plan component as discussed earlier in the Forest Plan.

The following goals and desired conditions explain the conditions, processes, and relationships that the Forest Service will seek to achieve. Some conditions may already exist and some are achievable during the life of the Forest Plan. Others may only be achievable during a longer period, for example, decades. Making progress toward achieving the goals and desired conditions will depend on funding and program direction provided by higher levels in the agency and Congress, and will also be affected by natural events.

A brief background and existing condition description of each indicator are provided, followed by the desired condition and statement of scale. The background and existing condition descriptions are provided for information and context; however, they are not plan components.

Management actions that cause movement away from achieving goals and desired conditions in the short term are acceptable so long as the goal is achieved or maintained in the long-term.

Goal 1: Promote Ecological Integrity

1.1 Watershed Function
- 1.1.1 Hydrologic Function
- 1.1.2 Riparian Function
- 1.1.3 Wetland Function and Groundwater-dependent Ecosystem Function
- 1.1.4 Stream Channel Function
- 1.1.5 Aquatic Habitat Function

1.2 Species Diversity

1.3 Federally Listed Species

1.4 Disturbance Processes
- 1.4.1 Wildland Fire
- 1.4.2 Insects and Diseases

1.5 Invasive Species

1.6 Structural Stages

1.7 Plant Species Composition

1.8 Stand Density

1.9 Air Quality

1.10 Soil Quality

1.11 Water Quality

1.12 Landscape Patterns

1.13 Special Plant Habitats
- 1.13.1 Whitebark Pine
- 1.13.2 Aspen
- 1.13.3 Sagebrush Steppe

1.14 Old Forest and Individual Old/Large Trees

1.15 Snags and Down Wood

Goal 2: Promote Social Well-Being

2.1 Scenery
- 2.1.1 Scenic Integrity and Scenic Stability

2.2 Recreation
- 2.2.1 Developed Recreation
- 2.2.2 Dispersed Recreation
- 2.2.3 Backcountry Recreation

2.3 Hunting and Fishing
- 2.3.1 Rocky Mountain Elk
- 2.3.2 Bighorn Sheep

2.4 Cultural Resources

2.5 Roads and Trails Access

2.6 Wildland Urban Interface

2.7 Tribal Rights and Interest

2.8 Culturally Significant Foods

2.9 Community Resilience

Goal 3: Promote Economic Well-Being

3.1 Facilities and Infrastructure

3.2 Land Ownership

3.3 Goods and Services
- 3.3.1 Forest Products
- 3.3.2 Livestock Grazing
- 3.3.3 Special Uses
- 3.3.4 Mineral, Energy, and Geological Resources
- 3.3.5 Water Use

Goal 1: Promote Ecological Integrity

Ecological integrity is the quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the historical range of variability and can withstand and recover from most disturbances imposed by natural environmental dynamics or human influence. Ecological integrity overlaps significantly with components of the other two goals in the Plan (social and economic well-being). The Umatilla's contribution to ecological function is described by watershed function, native and desired nonnative species diversity, disturbance processes, and invasive species. Ecological structure and composition are described by structural stages; plant species composition; stand density; and air, soil, and water quality. Landscape patterns, special habitats, and snags and down wood are also key components of healthy ecosystems in the Umatilla National Forest. Although the primary focus of this section is ecological integrity, this goal and the desired conditions are interrelated with the social and economic components of sustainability. Resources that contribute to ecological integrity are interrelated with tribal interests and treaty-reserved resources. Culturally significant foods, such as water, salmon, deer, cous,[3] and huckleberry, must be perpetually available for the cultural, economic and sovereign benefit of American Indian Tribes. These resources will be managed using traditional ecological and cultural knowledge and best available science.

1.1 Watershed Function

The existing and desired conditions for 1.1 Watershed Function are described by key watersheds and all watersheds and in 1.1.1 Hydrologic Function, 1.1.2 Riparian Function, 1.1.3 Wetland Function and Groundwater-dependent Ecosystem Function, 1.1.4 Stream Channel Function, and 1.1.5 Aquatic Habitat Function. The desired conditions for watershed function flow heavily from the 2018 Blue Mountains Aquatic and Riparian Conservation Strategy and the 2011 Watershed Condition Framework.

Background: Watershed function includes all the surface and subsurface processes acting on or beneath hillslopes and within stream channels that control the movement of water, wood, sediment, and nutrients. The rate at which these processes occur is affected by local geology, topography, and climate, and is moderated by local soil and vegetation. The movement of water and sediments modifies the physical structure of watersheds and determines the spatial distribution and composition of riparian and aquatic habitats.

Several elements combine to control the multiple processes that are fundamental to the development and long-term vitality of watersheds. These include characteristics of flow regime, composition of riparian areas and wetlands, stream channel characteristics, and habitat characteristics, each of which is described in this section.

Properly functioning watersheds will provide a range of benefits both on and off the Umatilla National Forest, including, but not limited to: providing habitat for terrestrial, aquatic, and riparian-dependent species; maintaining water quality; providing channel stability; reducing erosion; moderating floods; and maintaining reliable stream flows for downstream users.

Existing Condition: Since the beginning of European settlement in the mid-1800s, watershed conditions in the Umatilla National Forest have been altered by agriculture, livestock grazing, mining, timber harvest, fire suppression, the development of an extensive road network, dams,

[3] Cous was an important root crop for Native Americans. Source: http://science.halleyhosting.com/nature/basin/5petal/pars/lom/cous/cous.htm

stream channelization, and water diversions (Wissmar et al. 1994a) that have resulted in widespread degradation of riparian and aquatic habitats (McIntosh et al. 1994a). The near extirpation of beaver in the Pacific Northwest prior to 1840 is a likely factor in the decline of riparian and aquatic habitats in the Blue Mountains region, especially in basins where beaver was formerly abundant (Knopf and Scott 1990). Much of the remaining few high quality aquatic habitats are located on National Forest System lands and may no longer represent the historical condition, extent, or range of habitats available to aquatic species (Gregory and Bisson 1997, Sedell et al. 1997).

Challenges to maintaining existing high quality habitats and restoring degraded habitats over the upcoming decades include climate change predictions such as: higher than average temperatures; more winter precipitation falling as rain versus snow; diminishing winter snowpack resulting in earlier snowmelt; changes in runoff volume and lower summer base flows; higher surface water temperatures; and possibly greater year-to-year variability in precipitation that could include extended drought periods as well as greater magnitude floods such as those that have occurred in recent history. Flow regimes that change in response to climate change will have implications for terrestrial vegetation, terrestrial wildlife, riparian and aquatic species, and water availability for human and permitted livestock use.

The need to preserve remaining high-quality aquatic habitats to preserve existing at-risk fish species in the Pacific Northwest is well documented (McIntosh et al. 1994a, Lee et al. 1998, Reeves et al. 1995, Rieman et al. 2006). Current research indicates that maintaining the best remaining habitat and watersheds that currently support strong populations of anadromous and resident fish species is crucial to the continued existence and eventual recovery of these species.

The key watersheds are identified in the 2018 Blue Mountains Aquatic and Riparian Conservation Strategy (Appendix A). Key watersheds contain strong populations of select threatened, endangered and Forest Service sensitive aquatic species and the habitat needed to support them, or are areas that are expected to provide high quality habitat at some time in the future (Sedell et al. 1997). The selection of key watersheds is based on present knowledge of watershed and habitat conditions, recognition of restoration priorities within the Pacific Northwest Region of the Forest Service, and other information. The process used to select key watersheds is described by Reiss et al. (2008).

Key watersheds consist of individual subwatersheds or groups of subwatersheds within individual subbasins and are ultimately intended to form the centers of broadly connected networks of high-quality aquatic habitats, as well as to reduce fragmentation in existing habitats and core fish populations.

Fifty-two of 129 (all) subwatersheds (40 percent) on the Umatilla National Forest are identified in the Blue Mountains Aquatic and Riparian Conservation Strategy as key watersheds in the Umatilla National Forest based on the presence of strong populations of one or more aquatic species, and/or high-quality habitat characteristics and watershed conditions. Appendix A contains a map of key watersheds and a table that identifies the full list. Of these, 15 subwatersheds are identified as priorities for the Umatilla National Forest. As watershed restoration work is achieved under the Forest Plan, priority watersheds will be updated on an approximate 5-year interval. These updates will incorporate consideration of the Blue Mountains climate change vulnerability assessment (Halofsky and Peterson 2017).

The role of key watersheds is to serve as habitat refugia for existing fish populations and to provide sources of individuals that can colonize new habitats as conditions improve. The

management emphasis in all key watersheds is to protect existing populations and their habitats while incurring the lowest level of risk to those populations.

Key Watersheds and Subwatersheds with Endangered Species Act Critical Habitat for Aquatic Species

Desired Condition: Connected networks of watersheds with ecological form, function and processes, and functionally intact ecosystems contribute to and enhance conservation and recovery of specific threatened or endangered fish species and provide high water quality and quantity. The networks contribute to short-term conservation and long-term recovery at the major population group, core area, or other appropriate population scale.

Scale: Subwatershed to subbasin.

Desired Condition: Roads in key watersheds present minimal risk to aquatic resources.

Scale: Subwatershed to subbasin.

Desired Condition: Key watersheds have high watershed integrity and provide resilient aquatic and riparian ecosystems.

Scale: Subwatershed.

All Watersheds

Desired Condition: The watershed-scale processes that control the routing of water, sediment, wood, and organic material operate at levels that support native aquatic species and the proper function of their habitat and do not require human intervention or restoration.

Scale: Watershed or subwatershed.

Desired Condition: The distribution, diversity, and complexity of watershed features (i.e., submerged and overhanging large wood, log jams, and beaver dams, side channels, pools, undercut banks and embedded substrates) and natural processes, provide aquatic and riparian ecosystems to which species, populations, and communities are uniquely adapted.

Scale: Subbasin.

Desired Condition: Connectivity exists within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide unobstructed routes to areas critical for fulfilling all life history requirements of aquatic, riparian-dependent, and upland species of plants and animals.

Scale: Connectivity is within and between watersheds at the subbasin scale for forestwide planning; between subwatersheds at the watershed scale for project planning.

Desired Condition: Aquatic and riparian ecosystems are resilient to the effects of climate change and other major disturbances.

Scale: Subbasin for forestwide planning and watershed scale for project planning.

1.1.1 Hydrologic Function

Background: Hydrologic function includes all processes involved in the conversion of precipitation to streamflow and groundwater, as well as properties of the flow regime, including the magnitude, frequency, duration, timing, and variability of streamflow within a watershed. Each of the important physical and biological processes within watersheds, including the movement of water, sediment, wood, and nutrients, as well as the creation of aquatic habitats, are driven by variability of the flow regime (Angermeier 1997). Recurring flows of moderate to high magnitude are responsible for most sediment transport and maintain stream channel size and shape (Wolman and Miller 1960). High flows rearrange and create riparian habitats by dispersing seeds and creating sites for establishment of riparian species. In summer months, low flows sustain riparian vegetation that provides channel and bank stability, especially on low-gradient streams in wide, unconfined valleys. Differences in topography within riparian zones, combined with the differing water requirements and tolerances of riparian plant species result in diversity of habitat types.

On hillslopes, the primary controls of hydrologic function are topography, the type and density of vegetation, and the physical properties of soils. The alteration or removal of vegetation or ground cover by activities such as fire, timber harvest, the use of mechanized equipment, livestock grazing, and the construction of roads changes hydrologic pathways in ways that can result in increased hillslope and stream channel erosion rates.

Groundwater inflows and hyporheic exchange in streams and floodplains are important contributors to streamflow, especially in summer, and have the additional benefit of being a source of cool water that helps moderate stream temperatures.

Existing Condition: Runoff from watersheds in the Umatilla National Forest is largely dominated by snowmelt between March and June, along with the earlier runoff from low-elevation watersheds and later runoff from high-elevation watersheds. However, in lower elevation watersheds, a substantial part of annual streamflow, and most peak flow events, occur during winter rains between December and February. There is some indication of increasing summer streamflow in parts of the Umatilla since the early 1900s (Wissmar et al. 1994a) that some authors attribute to land use effects, but that could also be driven by changes in the seasonal distribution of precipitation, changes in the amount or method of downstream water use, changes in floodplain connectivity, or some combination of these. There is also evidence that the amount of precipitation that becomes streamflow is declining (Mote 2003; Knowles et al. 2006), which is consistent with observed climate warming since about 1950 and may be attributed to increased rates of evaporation and transpiration by terrestrial vegetation in response to increasing temperature (Huntington 2004). Changes in the timing of runoff, combined with changes in stream temperature due to climate change, could affect, for example, the timing of migration and spawning success of salmonid species, as well as alter the availability of water for downstream users.

> **Desired Condition:** Flow regimes, including water yield, timing, frequency, magnitude, and duration of runoff, are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of movement of sediment, nutrients, and wood. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are within the natural range of variability in which the system developed.
>
> **Scale:** Subwatershed to watershed.

Desired Condition: The timing, duration, and variability of floodplain inundation and water table elevation in wetlands, seeps, springs, and subsurface water connectivity are within the natural range of variability.

Scale: Subwatershed to watershed.

1.1.2 Riparian Function

Background: Riparian areas are loosely defined as the zones adjacent to stream channels, ponds, and lakes that are transitional between the channel and upland habitats (NRC 2002). Riparian vegetation includes species that require free or unbound water or soil conditions moister than normally found (Franklin and Dyrness 1973) in the surrounding uplands.

Riparian areas are important for their critical role in nutrient cycling, stream channel and bank stability, water quality, filtering of sediment from upslope areas, and the supply of particulate and woody organic material to stream systems. Riparian vegetation provides stream shade that contributes to thermal regulation in both winter and summer. Particulate organic material derived from riparian vegetation forms the base of aquatic food webs, while large organic material creates channel structure and habitat complexity. Some aquatic insects require certain types of riparian vegetation (e.g., willows) to complete their life cycles. An estimated 75 percent of terrestrial wildlife species in the Blue Mountains either depend on riparian zones directly or use them more than other habitats (Raedeke 1989, Thomas 1979). Riparian areas are considered the most critical of wildlife habitats in the Blue Mountains (Johnson and O'Neil 2001). This is due not only to the unique habitat features found in riparian zones, but also because they serve as natural corridors or migration routes and as connecting corridors between patches of suitable habitat in an otherwise fragmented landscape.

More than 180 riparian plant association types that can be broadly classed into tree, shrub, and herbaceous potential vegetation groups have been identified on National Forest System lands in the Blue Mountains region (Crowe and Clausnitzer 1997, Wells 2006).

Existing Condition: Based on surveys of perennial, fish-bearing streams, about 48 percent of riparian habitats in the Blue Mountains are forested, 29 percent are shrub-dominated, and 23 percent are currently classified as herbaceous. In forested sites, 97 percent are conifer dominated and 3 percent are hardwood dominated (primarily black cottonwood or aspen).

Hardwood tree and shrub-dominated riparian zones are known to have declined across the Blue Mountains since about 1850 (Lee et al. 1997, Wisdom et al. 2000), although the extent of loss on National Forest System lands is difficult to quantify. In streams that presently pass through dry coniferous forests that have been converted to young, dense stands of Douglas-fir, white fir, or both, shade-intolerant shrubs may be absent or in decline (Liquori and Jackson 2001). Direct impacts that result in lost or degraded riparian habitats and loss of channel stability and/or habitat complexity can occur from natural disturbances such as strong storm action (i.e., gullying, erosion from heavy precipitation events and debris flows), and from human-induced activities that include, but are not limited to grazing; motorized use in riparian habitat, along banks, or in water areas; conversion of floodplains to agricultural lands; road construction; mining; timber harvest; splash damming; and channelization.

Desired Condition: The species composition and structural diversity of native plant communities in riparian management areas, including wetlands, provides adequate side channels, pools, undercut banks, and unembedded substrates. These conditions result in a variety of depths, gradients, velocities, and structures for seasonal thermal regulation, nutrient filtering, appropriate rates of erosion, and channel migration, as well as supplies

amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability.

Scale: Watershed scale for forestwide planning; subwatershed scale for project planning.

Desired Condition: Riparian management areas within any given watershed reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.

Scale: Subwatershed.

Desired Condition: Key riparian processes and conditions (including slope stability and associated vegetative root strength, bank stability, wood delivery to streams, and within the riparian management areas, input of leafy and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistent with local disturbance regimes.

Scale: Subwatershed.

Desired Condition: Riparian vegetation has the species composition, structural diversity, age class diversity and extent that is characteristic of the setting in which it occurs and the hydrologic and disturbance regimes in which it developed. The condition and composition of small habitat patches may change over small temporal and spatial scales but the distribution of habitat patches remains relatively constant at larger scales. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.

Scale: Subwatershed to subbasin.

Desired Condition: Riparian shrub communities occupy their historical range and extent. Individual plants are capable of growing to their full potential typical for a particular species, as defined by plant height, width, and growth form. Individual plants are able to propagate, or reproduce, vegetatively or sexually. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.

Scale: Subwatershed.

Desired Condition: Riparian areas consist of native assemblages of riparian-dependent plants and animals free of persistent nonnative species and provide for dispersal and travel corridors, as well as connectivity, between geographically important areas for both terrestrial and aquatic animals and plant species within the Plan Area.

Scale: Subwatershed.

Desired Condition: The potential for large wood recruitment to streams from within forested riparian areas, and from low-order to higher order streams is similar to the potential in reference watersheds with similar forest vegetation types.

Scale: Watershed.

1.1.3 Wetland Function and Groundwater-dependent Ecosystem Function

Background: Wetlands, including swamps, bogs, seeps, fens, springs, peatlands, and marshes occur in areas where the soil is either inundated by water or saturated for at least part of the growing season. Wetlands may be hydrologically supported by precipitation, surface water, or groundwater. Groundwater-dependent ecosystems are a unique class of wetlands that are supported primarily or wholly by groundwater (i.e., fens). Wetland vegetation includes species that are adapted to saturated soil conditions. Some, but not all, streamside riparian areas that meet the above criteria may be classified as riverine wetlands (Cowardin et al. 1979), but wetlands occur in a variety of settings where there is a source of either surface or groundwater. Wetlands, in general, have disproportionately higher plant species diversity relative to surrounding upland habitats.

Small wetlands may be isolated from other surface waters and often represent unique habitats that are highly important to aquatic and terrestrial wildlife. Some wetlands are also important habitat for many sensitive, rare, or uncommon plant and lichen species, many of which occur only in these habitats.

Wetlands play an important role in protecting water quality, processing excess nutrients, and contributing to groundwater recharge, among other functions, but not all wetland types provide the same functions, nor do they provide them equally (Euliss et al. 2004). Many wetlands are sites of natural water storage that, depending on where they occur, contribute to groundwater recharge and can reduce the magnitude of floods. Because of the contribution to biological diversity, wetlands are regulated under Federal law by the Clean Water Act and through Executive Order 11990, which requires Federal agencies to limit or avoid activities that result in impacts to wetlands.

In addition, some wetlands are essential breeding, rearing, and feeding grounds for many species of fish and wildlife, including breeding bird populations, migratory bird, fish, and shellfish species. Approximately 75 percent of the terrestrial wildlife species in the Blue Mountains are known to use riparian or wetland habitats during their lifetimes (Raedeke 1989, Thomas 1979).

Headwater springs and their associated wetlands are important sources of stream flow in many drainages. More than 640 springs, representing an unknown fraction of groundwater resources, are present within the Umatilla National Forest. Many springs have been developed for watering livestock and wildlife and are also used for recreation consumption and for administrative use.

Existing Condition: As with riparian areas, the extent of wetland habitats in the Blue Mountains region has likely declined from historical conditions. In Oregon, wetlands have declined 38 percent since 1800 (Swift 1984). Isolated wetlands that represent unique habitat types are often used for human needs, including livestock watering. In streamside areas, the combined effects of water diversions, livestock grazing, beaver removal, channel degradation, and other impacts have resulted in widespread loss or conversion of wet meadow wetland types to dry meadows or upland shrublands.

> **Desired Condition:** The extent and diversity of wetland types is maintained or increased.
>
> **Scale:** Subbasin.
>
> **Desired Condition:** The surface and subsurface flow paths that support wetland habitats are functional. The timing and duration of inundation of wetlands are within natural ranges. Plant species composition in wetlands is characteristic of the biophysical setting in which they occur.

Scale: Subwatershed.

Desired Condition: The ecological structure and function of springs, peatlands, and groundwater fed wetlands are maintained or restored.

Scale: Subwatershed.

Desired Condition: The aquifer supplying water to groundwater-dependent ecosystems is not affected by groundwater withdrawal or loss of recharge. Soils of groundwater dependent ecosystems are intact and functional; erosion and deposition are within the natural range. Runout channels, if present, are functioning naturally and are not entrenched, eroded, or substantially altered.

Scale: Subwatershed.

Desired Condition: Vegetation is composed of the anticipated cover of plant species associated with the site environment; hydric species are present and are not replaced by upland species. Livestock herbivory and trampling are not adversely affecting sites.

Scale: Subwatershed.

Desired Condition: Water quality and quantity of groundwater resources, including seeps, springs, fens, and other groundwater-dependent ecosystems, is sufficient to provide for the extent and diversity of species associated with these habitats.

Scale: Watershed to subbasin.

1.1.4 Stream Channel Function

Background: Streams and rivers convey water, as well as sediment, nutrients, organic material, and dissolved substances. The physical attributes of stream channels are determined largely by local geology, topography, climate, and characteristics of the flow and sediment transport regimes. Small headwater (ephemeral) streams may comprise up to 70 to 80 percent of the channel length in any given watershed and are typically important sources of water, sediment, wood, and nutrients to larger streams (Benda 1990, May and Gresswell 2004, Reneau and Dietrich 1987).

Channel morphology represents the adjustment to channel slope, width, depth, flow, velocity, and sediment load (Leopold and Maddock 1953), bank composition (Schumm 1960), and the nature of riparian vegetation (Millar 2000). Leopold and Wolman (1957) recognized that channel properties vary continuously and, as a result, channel types should intergrade with each other. Suggested from this is the understanding that a wide range of channel types should exist in nature.

Existing Condition: Timber harvest, mining, water diversion, livestock grazing, channelization, and road construction adjacent to streams have all affected stream channels in the Umatilla National Forest. Most managed watersheds have high road densities (greater than 2.4 miles per square mile) that result in increased sediment delivery from road surfaces, drainage features, and road-stream crossings. Roads constructed within riparian areas are likely to directly affect stream channels or limit lateral migration of the channel.

Early timber harvest in the Umatilla focused on riparian areas because the areas were easily accessed and local rivers provided a method for conveniently transporting trees to sawmills (Sedell et al. 1991). Stream cleaning, combined with riparian timber harvest, has reduced in-

channel structure and channel stability and has removed potential sources of large wood to streams. Removal of beavers from most of the Blue Mountains region prior to about 1840 (Johnson and Chance 1974) was an early impact to low gradient streams in unconfined river valleys from which many of the streams still have not recovered.

Desired Condition: The physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, are properly functioning and in dynamic equilibrium with the flow and sediment regimes under which aquatic systems have evolved.

Scale: Subwatershed to watershed.

Desired Condition: Channel morphology, structure, complexity, and diversity are in ranges that are characteristic of the local geology, climate, and geologic processes.

Scale: Watershed.

Desired Condition: Measures of channel stability and morphology, including width-to-depth ratio, bank stability and bank angle, are within reference ranges and match the frequency distribution of reference sites for a given channel type and channel size.

Scale: Subwatershed to Subbasin.

Desired Condition: The sediment regime under which aquatic ecosystems evolved is maintained, including the timing, volume, rate, and character of input, storage, and transport.

Scale: Watershed.

Desired Condition: Large wood frequency and volume are within the natural range of variability and potential for streams in individual watersheds. The spatial and temporal distribution of wood in individual streams varies depending on valley, riparian, and channel characteristics and the disturbance processes (i.e., fire, flood, debris flow) responsible for transferring material from hillslopes to streams. The frequency distribution of large wood among individual streams is similar to the frequency distribution of reference sites.

Scale: Watershed.

Desired Condition: In forested watersheds, the distribution and frequency of wood-forced channel morphology (forced step pool and forced pool riffle streams), in which the majority of pools are formed by individual pieces or accumulations of large wood, and wood-rich pool riffle streams (Montgomery et al. 1995) is comparable to the distribution in reference watersheds.

Scale: Watershed.

Desired Condition: Pool frequency, size, depth, and volume are within ranges expected of given channel and valley types.

Scale: Subwatershed to watershed.

Desired Condition: Channel-floodplain connections are intact. Channel bed and bank erosion rates are within natural ranges and do not result in degraded aquatic, riparian habitats, or channel alteration.

Scale: Subwatershed to subbasin.

Desired Condition: Bank erosion is within a range that does not degrade aquatic or riparian habitats or that leads to channel alteration.

Scale: Subwatershed to subbasin.

Desired Condition: The frequency distribution of stream channel and habitat conditions for any given attribute approaches the frequency distribution of reference conditions for the same attribute in similar channel types.

Scale: Watershed to subbasin.

1.1.5 Aquatic Habitat Function

Background: Aquatic habitats are an important source of biodiversity because of the variety of physical and hydrologic settings in which they occur. Aquatic habitats can be divided into running water (streams and rivers) and open water (lakes, ponds, and wetlands) habitats. Open water habitats occur on river floodplains and in topographic depressions and may be hydrologically supported by either ground water or surface water. Backwater or off-channel areas that have physical connections to streams and rivers can be biologically important as rearing habitat for many aquatic species, including trout and salmon.

Aquatic habitats are shaped by a combination of physical and biological factors (including streamflow variability, sediment transport, stream channel characteristics, riparian habitat characteristics, water quality, accumulation, and the processing of wood and other organic material) and the connectivity and spatial distribution of habitat types within and adjacent to channel networks.

Existing Condition: Habitat degradation is one of the most commonly cited factors in the decline of resident and anadromous fish species in the Pacific Northwest (Gregory and Bisson 1997). Habitat quality may still be in decline in some parts of the Blue Mountains. McIntosh et al. (1994a) noted significant declines in large pool habitats in managed watersheds between 1930 and 1990, while increases in large pool habitat were noted in unmanaged watersheds during the same period. Some habitat types may have been under-represented historically on the Umatilla National Forest, underscoring the importance of the remaining high quality habitats, regardless of type or ownership. High road densities continue to contribute to poor aquatic and riparian habitat conditions. In addition, more than 1,285 culverts block or impair access by aquatic species to more than 3,700 miles of streams within the three national forests in the Blue Mountains.

Desired Condition: Aquatic habitats contribute to ecological conditions capable of supporting self-sustaining populations of native species, and diverse plant, invertebrate, vertebrate aquatic and riparian-dependent species. Aquatic habitats are key for the recovery of threatened and endangered fish species and provide important habitat components for all native aquatic species.

Scale: Subwatershed to subbasin.

Desired Condition: The transfer of wood, sediment, nutrients, and other material that occurs following fires, wind storms, floods, and other natural disturbances is capable of creating and maintaining the range and diversity of riparian and aquatic habitat conditions that occurs in reference watersheds.

Scale: Watershed.

Desired Condition: National Forest System lands contribute to the protection of population strongholds for State-classified sensitive species, narrow endemics, federally listed or proposed threatened and endangered aquatic species and designated critical habitats. These strongholds provide high quality habitat (e.g., spawning, rearing, over-wintering areas, and critical habitats, including migratory corridors), support expansion and recolonization of species to adjacent watersheds, and function in a manner that is resilient to natural disturbance regimes. These areas conserve key demographic processes likely to influence the persistence of populations or metapopulations. Areas adjacent to these high-quality habitats are restored (as appropriate) and protected to help ensure adequate connectivity, species distribution, and the maintenance or restoration of fully functioning habitats for all life histories of aquatic species.

Scale: Subwatershed to subbasin.

Desired Condition: Aquatic habitat elements (e.g., substrate, pools, cover, food, and water quantity and quality) are properly functioning and are sufficiently distributed to ensure egg and embryo survival, fry emergence, and juvenile survival of aquatic species to support self-sustaining populations of native resident and anadromous fish. Spawning and rearing areas contain a minimal amount of fine sediment, ranging in size from silt to coarse sand.

Scale: Subwatershed to subbasin.

Desired Condition: Native fish species have access to historically occupied aquatic habitats and connectivity between habitats allows for the interaction of local populations. Migratory habitats support juvenile and adult mobility and survival between spawning, rearing, overwintering, and foraging habitats containing areas that:

- are free of obstruction and excessive levels of predators of federally listed aquatic species;
- have minimal physical, biological, or water quality and quantity impediments (including permanent, partial, intermittent, or seasonal barriers); and
- contain natural cover such as large wood, aquatic vegetation, rocks and boulders, side channels, and undercut banks.

Scale: Subwatershed to subbasin.

Desired Condition: The potential for large wood recruitment to streams from within forested riparian areas, and from low-order streams to higher-order streams, is similar to the potential in reference watersheds containing the same (riparian) forest vegetation types.

Scale: Watershed.

Desired Condition: Aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths, size and frequencies, channel morphology, large woody debris size and frequency) in the population of watersheds on the Umatilla are similar to the distribution of conditions in the population of similar, reference watersheds. The distribution of conditions in individual streams varies depending on valley, riparian, and channel characteristics.

Scale: Reference conditions can be drawn from forest-level or Provincial scales. Conditions assessed at the subbasin scale for forestwide planning and watershed scale for project planning.

Desired Condition: Aquatic and riparian ecosystems are resilient to the effects of climate change and other major disturbances.

Scale: Subbasin scale for forest planning and watershed scale for project planning.

1.2 Species Diversity

Background: Providing the appropriate amount, distribution, and quality of habitat for native and desired nonnative aquatic and terrestrial species (plants, animals, vertebrates, and invertebrates) within the Umatilla National Forest is an integral component of ecological function. The ability to sustain this habitat, as well as the connectivity of habitat patches, is also important to the maintenance of ecological function.

The National Forest Management Act requires land and resource management plans to contribute to the diversity of plant and animal communities, based on the suitability and capability of the land area, while meeting overall multiple use objectives. The goal for this approach is to provide the ecological conditions that support a diversity of native plant and animal species within a Plan Area. Natural ecosystems are sustainable only when the native biodiversity (the variety of life and its processes) and the functional basis of productivity are maintained (Johnson and O’Neil 2001).

Comparing the existing vegetation communities to a set of reference conditions (pre-settlement time period or historical range of variability) allows for changes in disturbance regimes to be evaluated and serves as a check on the adequate representation of ecological communities (Samson 2002), which in turn should support species diversity. There are instances where maintaining ecosystem diversity might not provide the ecological conditions necessary to sustain populations of certain species, in which case a species-specific approach is warranted. This is often the case for species listed by either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service under the Endangered Species Act (see Section 1.3).

The Forest Plan focuses on four groups of species: (1) threatened, endangered, and proposed, (2) surrogate species, (3) focal species, and (4) other species of management interest, such as bighorn sheep and greater sage-grouse. In addition, some plan components address general habitat issues and enhance viability of all species. Threatened and endangered species are those formally listed and proposed species are those proposed for listing under the Federal Endangered Species Act of 1973.

Surrogate species represent other species that share similar habitat and risk factors and include Region 6 sensitive species, State-listed species, or other species for which the published literature has identified a concern for their viability. The key characteristic of a surrogate species is that its status and trend provide insights to the integrity of the larger ecological system to which it belongs. Surrogate species serve an umbrella function in terms of encompassing habitats needed for other species, are sensitive to the changes likely to occur in the area, or otherwise serve as an indicator of ecological sustainability.

Under the 2012 Planning Rule, focal species have replaced management indicator species for monitoring in Forest Plans. Focal species are a small subset of species that have specific objectives and monitoring requirements. Their status permits inference to the integrity of the larger ecological system to which they belong and provides meaningful information regarding the

effectiveness of the Plan in maintaining or restoring the ecological conditions to maintain the diversity of plant and animal communities in the Plan Area.

Existing Condition: Habitats have been impacted by interrelated changes in ecological process due to logging, roads, grazing, fire suppression, and rural development. Although management issues exist for most vegetation communities, the primary impacts from human induced activities over the last 100 years have resulted in extensive changes in the distribution, structure, and species composition of the ponderosa pine forest.

The Umatilla is home to hundreds of wildlife species. Common large mammals include Rocky Mountain elk, mule deer, and black bear. Several furbearers are present, such as beaver, marten, and raccoon. Many species of small mammals, birds, bats, reptiles, and amphibians reside within the vegetative communities, and the aquatic environments are home to several anadromous fish species.

A total of 175 species were identified as being of local and/or regional concern for the Plan Area. The Pacific Northwest Region of the Forest Service adopted processes to guide identifying these terrestrial (USDA Forest Service 2010b) and aquatic species (Reiss et al. 2008), as well as for assessing plant species (Holmes et al. 2009). Terrestrial species were grouped by potential vegetation group; risks and threats were identified for the group and a representative species (surrogate species) was selected for the group. Many of the surrogate species were determined to have well distributed source habitats that were reasonably connected and similar to what would have been on the landscape historically. However, there were some species (e.g., white-headed woodpecker) where source habitats were far diminished from what probably occurred historically and those existing habitats had poor connectivity.

Table 2 lists terrestrial and aquatic surrogate and focal species for the Umatilla National Forest. Additional information about surrogate species and their conservation strategies is available in the project record.

Table 2. Terrestrial surrogate and focal species

Family	Group	Common Name	Surrogate Species	Focal Species
Alpine/Boreal	Boreal Forest	Boreal Owl	yes	no
Alpine/Boreal	Boreal Forest	Water Vole	yes	no
Forest Mosaic	All Forest Communities	Northern Goshawk	yes	no
Medium/Large Trees	All Forest Communities	Cassin's Finch	yes	no
Medium/Large Trees	Cool/Moist Forest	Pileated Woodpecker	yes	yes
Medium/Large Trees	Cool/Moist Forest	American Marten	yes	no
Medium/Large Trees	Dry Forest	White-Headed Woodpecker	yes	yes
Open Forest	All Forest Communities	Western Bluebird	yes	no
Open Forest	All Forest Communities	Fringed Myotis	yes	no
Open Forest	Early Successional	Fox Sparrow	yes	no
Open Forest	Post-Fire Habitat	Lewis's Woodpecker	yes	no
Open Forest	Post-Fire Habitat	Black-Backed Woodpecker	yes	no
Human Disturbance	Habitat Generalist	Peregrine Falcon	yes	no

Family	Group	Common Name	Surrogate Species	Focal Species
Human Disturbance	Habitat Generalist	Wolverine	yes	no
Human Disturbance	Habitat Generalist	Rocky Mountain Elk	no	yes
Human Disturbance	Habitat Generalist	Mule Deer	no	yes
Woodland/Grass/Shrub	Woodland/Grass/Shrub	Lark Sparrow	yes	no
Woodland/Grass/Shrub	Woodland/Grass/Shrub	Pallid Bat	yes	no
Woodland/Grass/Shrub	Shrub	Sage Thrasher	yes	no
Woodland/Grass/Shrub	Grassland	Northern Harrier	yes	no
Chambers/Caves	Chambers/Caves	Townsend's Big-Eared Bat	yes	no
Riparian	Conifer Riparian	Rocky Mountain Tailed Frog	yes	no
Riparian	Riparian/large tree or snag/open water	Bald Eagle	yes	no
Riparian	Shrubby/Deciduous Riparian	Macgillivray's Warbler	yes	no
Riparian	Pond/Small Lake/Backwater	Columbia Spotted Frog	yes	no
Wetland	Marsh	Marsh Wren	yes	no
Wetland	Marsh/Wet Meadow	Wilson's Snipe	yes	no
Streams and Rivers	High-elevation, cold water, fall-spawning, associated with streambed, non-anadromous species	Bull Trout	yes	yes
Streams and Rivers	Mid and low elevation, cool water habitat, medium and large rivers, below Hells Canyon dam complex, fall-spawning, anadromous species	Chinook Salmon	yes	yes
Streams and Rivers	Mid-elevation, small to medium rivers and streams, cool water, below Hells Canyon dam, spring-spawning, anadromous species	Steelhead	yes	yes
Streams and Rivers	Mid-elevation, small to medium rivers and streams, cool water; mid-water column, interior Great Basin, upstream of Hells Canyon dam, spring-spawning, non-anadromous species	Redband Trout	yes	yes

Although most fish habitat in the Planning Area is in fair condition based on aquatic species sustainability modeling, there are few strong populations remaining for any of the surrogate fish species. Current habitat conditions are reflective of past and current management and are slowly recovering in some areas, though they remain static in others, based on 15 years of monitoring data. Local populations are still affected by many factors outside and downstream of the Planning Area, including habitat conditions and connectivity in the migration corridors, as well as, in the case of anadromous populations, up and downstream passage through the mainstem Columbia and Snake River hydropower dams and reservoirs, commercial and recreational fishing regulations, hatcheries, estuary and ocean conditions.

Desired Condition: The desired conditions for Watershed Function (Section 1.1), Disturbance Processes (Section 1.4), Invasive Species (Section 1.5), Structural Stages (Section 1.6), Plant Species Composition (Section 1.7), Stand Density (Section 1.8), Soil Quality (Section 1.10), Water Quality (Section 1.11), Landscape Patterns (Section 1.12), Special Plant Habitats (Section 1.13), Old Forest and Individual Old/Large Trees (Section 1.14), and Snags and Down Wood (Section 1.15) approximate historical habitat conditions, providing a greater likelihood of supporting species diversity.

The range of habitats for native and desired nonnative fish, wildlife, and plant species, including threatened and endangered species, species identified on the Regional Forester's Sensitive Species List, and surrogate species, is of adequate quality, distribution, and abundance to provide for viable populations of native and desired nonnative species. This includes the ability of species and individuals to interact, disperse, and find security within habitats in the Plan Area. Habitat conditions are resilient and sustainable considering the range of possible climate change scenarios. Risk factors (e.g., roads, uncharacteristic wildfires, livestock use, invasive species, etc.) do not threaten their population viability.

Specialized habitat components, such as caves, standing dead trees, seeps, and springs are found across the landscape in amounts and types commensurate with the natural communities in which they occur and their setting facilitates their use by associated species.

Population strongholds for surrogate fish species provide high quality habitat and support expansion and recolonization of species to adjacent unoccupied habitats. These areas conserve key demographic processes likely to influence the sustainability of aquatic species.

An abundant food base for fish, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish exist. Low levels of occurrence of nonnative predatory, interbreeding, or competing species exist, and if present, they are temporally and spatially isolated from federally listed species.

Scale: Applied at a variety of scales (national forest, subbasin, watershed and subwatershed).

1.3 Federally Listed Species

Background: Section 7(a)(1) of the Endangered Species Act requires all Federal agencies to use their authorities to conserve listed species and the ecosystems upon which they depend. Federal agencies should promote the conservation and recovery of listed species, as well as implement and fund conservation agreements, management plans, and recovery plans developed for those

listed species. Portions of the Umatilla National Forest are discussed in one or more recovery plans for federally listed species. Those recovery plans identify "Limiting Factors and Threats," most of which include human-induced activities (i.e., management-related actions such as grazing, mining, railroad or splash-dam logging). Areas currently supporting habitats across the Umatilla National Forest that overlap with federally listed species or those located within critical habitat require a focused protection and restoration strategy designed to recover listed species while pursuing land management activities.

Existing Condition: Protection and management of listed species and their habitats continue to be important issues within the Plan Area. Because of the extent of decline in populations, the contraction of the range of listed species, and the degradation of their habitats, protection of remaining strong populations or strongholds and their habitats is crucial to their recovery.

Within the Plan Area, eight (one mammal, two plants, and five fish) species are listed by either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service under the Endangered Species Act.

Plant species within the Umatilla National Forest that are listed under the Endangered Species Act include Spalding's catchfly. Addressing threats to Spalding's catchfly on National Forest System lands, such as invasions by aggressive nonnative plants, poor to degraded land health conditions, and changing fire frequency and seasonality are important for long-term viability of the species. No critical habitat has been designated for Spalding's catchfly within the Umatilla.

The wolverine is a proposed species for listing under the Endangered Species Act and gray wolves are listed endangered west of Highway 395 in the Blue Mountains and managed under the Wolf Management Plan for Oregon (ODFW 2005, updated in 2010). The Umatilla National Forest has the gray wolf federally listed on 20 percent of National Forest System lands. No critical habitat has been designated for gray wolf within the Blue Mountains.

Existing threats include physical barriers, such as road culverts, barriers created by high water temperatures or low seasonal flow, and competitive or predatory interaction with nonnative species. The extent to which a passage barrier impacts a specific aquatic species may be at a reach, subwatershed or subbasin scale. Long-term viability of federally listed aquatic species is dependent, in part, upon availability of sufficient high quality spawning and rearing habitats within subbasins through time, as well as population and habitat connectivity within and between subbasins (e.g., migration habitat). Remaining spawning and rearing habitats (i.e., submerged and overhanging large wood, log jams and beaver dams, side channels, pools, undercut banks or unembedded substrates) for aquatic listed species in the Blue Mountains range from poor (i.e., features are absent) to good condition (i.e., features are present), depending on the subbasin. Remaining migratory habitats for aquatic listed species within the Blue Mountains also range from poor to good condition, depending on the subbasin, with respect to the absence or presence, respectively, of water quality and quantity, migratory habitat, and thermal refugia.

> **Desired Condition:** Federally listed species (aquatic and terrestrial) trend towards recovery or are delisted. Management activities improve the conservation status of listed species and designated critical habitat. Habitats are managed in accordance with conservation planning documents, recovery plans, best available scientific information, and local knowledge. Critical habitat components (i.e., primary constituent elements and primary biological features) are protected and restored to achieve species recovery.

Desired Condition – Aquatic: For listed aquatic species on National Forest System lands (Table 3), spawning, rearing, and migratory habitat is widely available and inhabited. Listed aquatic species have access to historical habitat and appropriate life history strategies (i.e., resident, fluvial, adfluvial and anadromous) are supported. Recovery is promoted through cooperation and coordination with Tribes, State agencies, Federal agencies, and other interested groups.

Table 3. Federally listed aquatic species present in or within downstream influence of the Umatilla National Forest

Species, Evolutionarily Significant Units (ESU) / Distinct Population Segment (DPS)	Critical Habitat
Steelhead, Middle Columbia River	Yes
Steelhead, Snake River Basin	Yes
Bull trout, Columbia River Basin	Yes
Spring-Summer Chinook salmon, Snake River Basin	Yes
Fall Chinook salmon, Snake River Basin	Yes (downstream influence)

Desired Condition – Terrestrial Wildlife: For listed terrestrial species, habitat that adequately provides ample resources for all life stages is available and inhabited. Recovery is promoted through cooperation and coordination with Tribes, State agencies, Federal agencies, and other interested groups.

Desired Condition – Plants: For listed plant species, threats such as invasions by aggressive nonnative plants, adverse livestock grazing management, and changes in fire frequency and seasonality are addressed. Populations achieve recovery through cooperation and coordination with Tribes, State agencies, Federal agencies, and other interested groups.

Scale: A variety of spatial scales and hydrologic boundaries (ranging from individual projects to subwatersheds to areas as large as populations) apply to all of the categories above. Species recovery plans identify activities necessary for recovery at the project (reach), subwatershed and population scales. Species recovery plans further describe high-priority restoration actions at these scales that address identified limiting factors and threats to listed species and designated critical habitats.

1.4 Disturbance Processes

Background: Pickett and White (1985) provide a broadly quoted definition of disturbance:

> “Any relatively discrete event in time that disrupts ecosystems, community, or population structure and changes resources, substrate availability, or the physical environment.”

Natural disturbances include wildfire, insects and diseases, flooding, drought, landslides, windstorms, and disturbance by large herbivores. Disturbances, whether natural or human-induced, affect all aspects of ecosystems at a landscape level. Human-induced disturbances in the Umatilla National Forest include, but are not limited to those from: timber harvesting, road construction, mining, livestock grazing, recreation, and fire/fuels management. Disturbance from the above activities can impact habitat stages, successional stages and pathways, and structural differentiation; nutrient cycles, forage availability, and water quality and quantity yields; wildlife variety and quantity; the availability and economic value of forest products; carbon balances; and

scenic variability. Disturbances have a particularly profound effect on forest and other plant communities since they often kill vegetation and thus make space and resources available for surviving or new plants to utilize (Oliver and Larson 1996).

Disturbances can be either internal or external in relation to the ecosystem they affect. They can be biotic (i.e., insects, disease, animal damage) or abiotic (i.e., wind, flood, fire) and they can be large (measured in thousands of acres) or small (measured in square feet). They can be intense (such as crown fires) or considered minimal (such as creeping ground fires). They can occur very frequently at relatively regular intervals, or infrequently at irregular intervals. One thing most disturbance agents have in common, however, is that they rarely act alone. Most disturbance events are a complex interaction of many disturbance agents (Rogers 1996). Agents such as drought and fire or disease and insects most often act in concert across the time and space continuum in shaping the landscape. While it is true that a discrete large and final event, for instance a landslide, drastically alters a successional course; a recent heavy rain-on-snow event likely contributed to the total amount of the effects that occurred.

In many ecosystems, biotic communities have developed adaptations to specific disturbances. Many plant species, for example, may rely on either fire or floods for reproduction and are thus disturbance-dependent. The effect of any disturbance is a property of the disturbance as well as the system it affects.

The existing and desired conditions for 1.4 Disturbance Processes are described in 1.4.1 Wildland Fire, 1.4.2 Insects and Diseases, and 1.1.5 Aquatic Habitat Function.

1.4.1 Wildland Fire

Background: Fire is a natural part of the ecosystem process, and ecosystems within the Umatilla National Forest exhibit a wide diversity of natural fire behavior. In terms of fire management, wildland fires are generally categorized as either prescribed fires (planned ignitions) or wildfires (unplanned ignitions). Prescribed fires are ignited by a management action and are designed to meet specific land management objectives. Wildfires are those not ignited by management actions. Some wildfires are managed with methods other than full suppression to meet specific land management objectives.

A fire regime is a generalized description of the role fire plays in the natural ecosystem. Fire regimes depicted in this Forest Plan are based on a national classification of the historical natural combined conditions for fire severity and frequency that are usually associated with a particular vegetation environment.

“Fire severity” describes the effects (actual or potential) of fire on vegetation. Fire severity as characterized by the LANDFIRE Project (see www.landfire.gov) can be summarized by these three broad categories (Rollins 2009):

- Low-severity fire, meaning less than 25 percent average vegetation top-kill
- Mixed-severity fire, meaning greater than 25 and less than 75 percent average vegetation top-kill
- High-severity fire, meaning greater than 75 percent average vegetation top-kill

Fire Regime	Fire Frequency/Severity	Common Forest Type
I	Frequent (Usually Surface) /Low-to-Mixed	Dry Upland
II	Frequent/High	Dry Grasslands
III	Moderate-to-Relatively Long Intervals (35-100 Years) Between Fires/Mixed	Moist Upland
IV	Moderate-to-Long Intervals/Mixed-to-High	Cold Upland

Fire regime condition class is a way of classifying the current degree of change from the natural historical fire regimes and their characteristic vegetation and fuel conditions. There are three condition classes for each fire regime and each classification is based on a departure score that indicates the relative amount of departure from the historical regime. The departure score can be thought of as being a product of two major elements: the condition of the vegetation and the fire frequency or severity. As characterized in this Forest Plan, fire regime condition class vegetation departure scores focus on vegetation and do not include fire severity or frequency as a quantitative part of the score. This allows the effects of proposed management on vegetation attributes such as structure, density, and species composition to be more clearly defined. The three fire regime condition classes resulting from this vegetation departure scoring are:

Class 1 – a low degree of departure,
Class 2 – moderate departure, and
Class 3 – high departure from the natural (historical) fire regime.

Existing Condition: A number of local fire history studies show that frequent, low severity fire such as that described by fire regime I was characteristic of the Blue Mountains region (Johnston 2016, Heyerdahl and Agee 1996, Agee 1993). A large amount of scientific evidence shows that the current level of fuels in the Blue Mountains forests, as well as throughout many of those in North America, greatly exceeds what would have been expected in more “natural” or pre-European settlement conditions. The accumulation of fuel is largely a result of human activities, including fire suppression and historical logging practices (Dodge 1972). Thousands of acres of dry upland and mixed conifer forests within the Blue Mountains now contain unusually high levels of forest fuels. These conditions, along with predicted impacts from climate change for longer fire seasons and more severe fires (Halofsky and Peterson 2017) are setting the stage for the creation of fires with uncharacteristically intense conditions (Franklin and Agee 2003; Hessburg et al. 2005; Stine et al. 2014). The potential for the scenarios mentioned above increases both the challenge and the motivation for restoring the landscape to reduce effects from any impacts of wildfires.

Modeling based on current vegetation data indicate that under relatively severe fire weather conditions (90th percentile), much of the area in the national forests of the Blue Mountains has the potential to experience high severity fire effects. For example, the vegetation and fuel attributes indicate that the potential for high severity fire behavior in the moist upland forest exists in about 30 to 40 percent of the area and within around 50 to 60 percent of the cold upland forest environments. These proportions for the moist and cold upland forests are close to what is estimated for natural levels (Countryman and Justice 2010). In some ecosystems within the Umatilla National Forest (like the subalpine and higher elevation moist upland forests composed of spruce, subalpine fir and lodgepole pine), this is considered normal.

For other areas, such as those in dry upland forests, the current potential for high severity fire is not within the historical range of variability. For example, the LANDFIRE Project estimates that under natural historical conditions, at any given point in time, only about 5 to 15 percent of the dry upland forest would contain fuel and vegetation conditions likely to support high severity fire. Currently on the Umatilla National Forest, roughly 55 percent of the dry forest has the potential structure and species composition to support high severity fire behavior. This is largely the result of the cumulative effects of increasing vegetation density, shifts in forested species composition, modified landscape patterns, as well as the cumulative effects of periodic and sometimes extended drought. These conditions put the ecosystem at high risk of uncharacteristically large and severe fires and may degrade or eliminate the dry upland forests natural resilience to wildfire. (See related sections for forest vegetation desired conditions; Sections 1.6-1.8, 1.12, and 2.6). Table 4 displays forestwide vegetation departure scores of the existing succession classes for each broad potential vegetation group. The higher the number, the greater the forest vegetation and fuel condition has departed from the naturally expected condition. Scores less than 33 are considered low; 33 to 66 is considered moderate and over 66 is high degree of departure. The dry upland forest consistently exhibits vegetation departure scores at the high end of moderate, which indicates the dry upland forest is nearing a highly departed state in terms of vegetation. Within the moist upland forest, the score is in the low range. Within the cold upland forest potential vegetation group, the vegetation departure score is at a low-level.

Table 4. Forestwide vegetation departure scores

Potential Vegetation Group	Score
Dry upland	60
Moist upland	27
Cold upland	13

The Blue Mountains are dominated by ecosystems that evolved with the relatively frequent low to mixed severity fires typical of natural fire regimes I, II, and III. Approximately 86 percent of the Umatilla National Forest is classified as either fire regime I, II or III and 55 percent is classified as fire regime I. Much of this landscape is currently moderately departed from reference conditions or approaching a highly departed condition in terms of forest vegetation fuels.

The gradual accumulation of wildland fuels is a difficult and challenging issue to address. An analogy can be made to walking “up the down” escalator. One must be moving just to stay in place; the only way for forward progression is to move faster than the escalator is moving down. Despite current investments in priority areas being treated through fuels management or burned in wildfires, some landscapes are accumulating fuels at a rate faster than can be managed. Broad-scale efforts to reduce fuels across the landscape can be expensive and time-consuming and require strategic coordination regardless of which type of fuels management activity is implemented (Wildland Fire Executive Council 2014).

> **Desired Condition:** Fire adapted and fire resilient landscapes are restored and maintained. Wildland fire (planned and unplanned ignitions) plays a characteristic ecological role in creating forest and rangeland conditions that are resilient to disturbances and climate changes. Table 5 displays the natural historical fire regimes and their associated desired condition ranges for fire severity and frequency by potential vegetation group. Wildland fire may be suitable on all acres, depending on expected fire effects and resource objectives.

In priority, important, and general habitat management areas and sagebrush surrogate areas, sagebrush habitat is protected from loss due to unwanted wildfires or damage resulting from management-related activities while agency risk management protocols are used to manage for firefighter and public safety and other high priority values. Under all fire response categories, first priority is the management of risk to firefighters and the public.

Landscapes that are in fire regime condition class 1 or exhibit a low vegetation departure score and conditions are maintained over time. Wildland fire disturbances and their associated effects occur within historical natural fire regimes similar to those that occurred prior to the modern fire exclusion (suppression) era.

Table 5. Desired conditions for wildland fire regimes

Potential Vegetation Group	Fire Regime	Fire Severity	Fire Frequency (years)
Cold upland forest	IV	mixed-high	100-200
Moist upland forest	III	mixed	30-150
Dry upland forest	I	low-mixed	5-25
Dry upland woodland	III	mixed	80-160
Cold upland shrubland	III-IV	mixed-high	30-60
Moist upland shrubland	II-III	mixed-high	10-40
Dry upland shrubland	II	high	20-40
Cold upland herbland	IV	high	30-80
Moist upland herbland	II	high	20-40
Dry upland herbland	II	high	5-20
Cool/Cold riparian forest	III-IV	mixed-high	100-200

Vegetation composition and structure, and fuels characteristics are similar to those that existed under the historical fire regime (see Desired Conditions 1.6 – Structural Stages 1.7 – Plant Species Composition, 1.8 - Stand Density, and 1.12 – Landscape Patterns). Risk of loss for key ecosystem components is low.

Safety of fire personnel and the public is the highest priority and can best be achieved by proactive management of the landscape. Implement responses in a cost efficient manner and consistent with land and resource management objectives. Specific strategies for managing wildland fires will depend upon the fire location, expected fire behavior, and values at risk. Fire is managed to restore the ecosystem process essential to maintaining resilient landscapes; by utilizing current science, modern decision tools, and collaborative decisionmaking. Prescribed fires are considered the most effective fuels management tool for restoring and maintaining fire-adapted systems; therefore, planned (prescribed) fire will be used in all management areas covered in this plan. Partnerships with other counties, agencies, states, Tribes, local governments, and landowners maximize wildfire response capabilities and meet multiple land management objectives across ownership boundaries.

Scale: Minimum scale of subwatershed for each of the conditions described above. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

1.4.2 Insects and Diseases

Background: Forestland susceptibility to major insects and disease disturbances is heavily influenced by stand and landscape-level tree species composition, stand density, and stand structure, which can be affected by timber harvest, grazing, climate change, and fire suppression (Hessburg et al. 1999). Some past management activities have led to unanticipated large, landscape-level changes and have increased the potential for uncharacteristic disturbances from insects and diseases across the landscape.

Existing Condition: At the subbasin level, there have been increases in vulnerability to bark beetles, defoliators, mistletoes, and root diseases due to increased cover, connectivity, stand densities, and multi-storied canopies of Douglas-fir and grand fir dominated stands (Hessburg et al. 1999). There is also a continued loss of whitebark pine and western white pine due to white pine blister rust.

Shade-tolerant tree species now dominate the forests to a much greater extent today than they did in the past. Forests are more dense and contiguous than they were historically. Changes like these have created landscapes more susceptible to uncharacteristically severe insect and disease disturbances. These changes have the potential to impact wildlife habitat, recreational use, fisheries resources, and the flow of products from National Forest System lands.

> **Desired Condition:** Characteristic levels of mortality caused by insect and disease activity contribute to diverse landscape conditions and provide important wildlife habitat components, such as hollow trees, dead wood, and mistletoe brooms. The desired conditions for vegetation structure, stand density, and species composition (displayed in Sections 1.6, 1.7, and 1.8) create stand conditions with largely low to moderate vulnerability to insects and diseases across the majority of the upland forest potential vegetation groups. These stand conditions result in ecologically resilient forests with composition, structure, and density characteristics that are fully compatible with periodic disturbance occurring at characteristic levels of severity, intensity, size, and spatial distribution.
>
> **Scale:** Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

1.5 Invasive Species

Background: Invasive species (aquatic, terrestrial, invertebrate, and vertebrate plants and animals) are recognized as a major threat to native plant and animal communities, as well as to social and economic conditions. The effects of invasive species can cause reductions in long-term productivity of the land, be detrimental to aquatic systems, cause economic loss, disrupt recreational use, and reduce resource production. A wide range of species can be invasive, including plants, fish, animals, insects, fungi, mussels, and pathogens such as white pine blister rust. Some species are commonly transported between water bodies by recreational boating and fishing activities.

Existing Condition: The area affected by invasive plant species has increased throughout the Interior Columbia Basin during the last 100 years (Quigley et al. 1996). The same trend has also occurred in the Blue Mountains during the last 10 to 15 years. A large portion of the Blue Mountains is characterized as being susceptible to invasive plants (Quigley et al. 1996). The susceptibility is most prevalent in areas dominated by dry forest, dry grass, dry shrub, and cool shrub types, which are the types of sites that many invasive species evolved in and are adapted to.

The current level of invasive plant species in the Blue Mountains is about 55,000 acres (this amount includes some overlap between species).

Other examples include the invasive insect balsam woolly adelgid, which infested 40,000 to 60,000 acres per year from 2005 to 2006 in the Blue Mountains and caused substantial mortality in high-elevation true firs. The nonnative invasive pathogen white pine blister rust is also found throughout the range of western white pine, whitebark pine and the isolated limber pine stands in the Blue Mountains.

Invasive aquatic pathogens, plants, and animals are not currently widespread in the headwater streams and lakes of the Blue Mountains. However, many highly invasive aquatic species are well established in neighboring states, in the Columbia River, and in the lower reaches of major tributaries adjacent to the Umatilla. Streams and springs within the national forest are at risk of invasion by detrimental invasive organisms, such as New Zealand mudsnails and Asian clams. Lakes and reservoirs are at risk of invasion by zebra mussels, hydrilla, and other highly undesirable introduced plant and animal species.

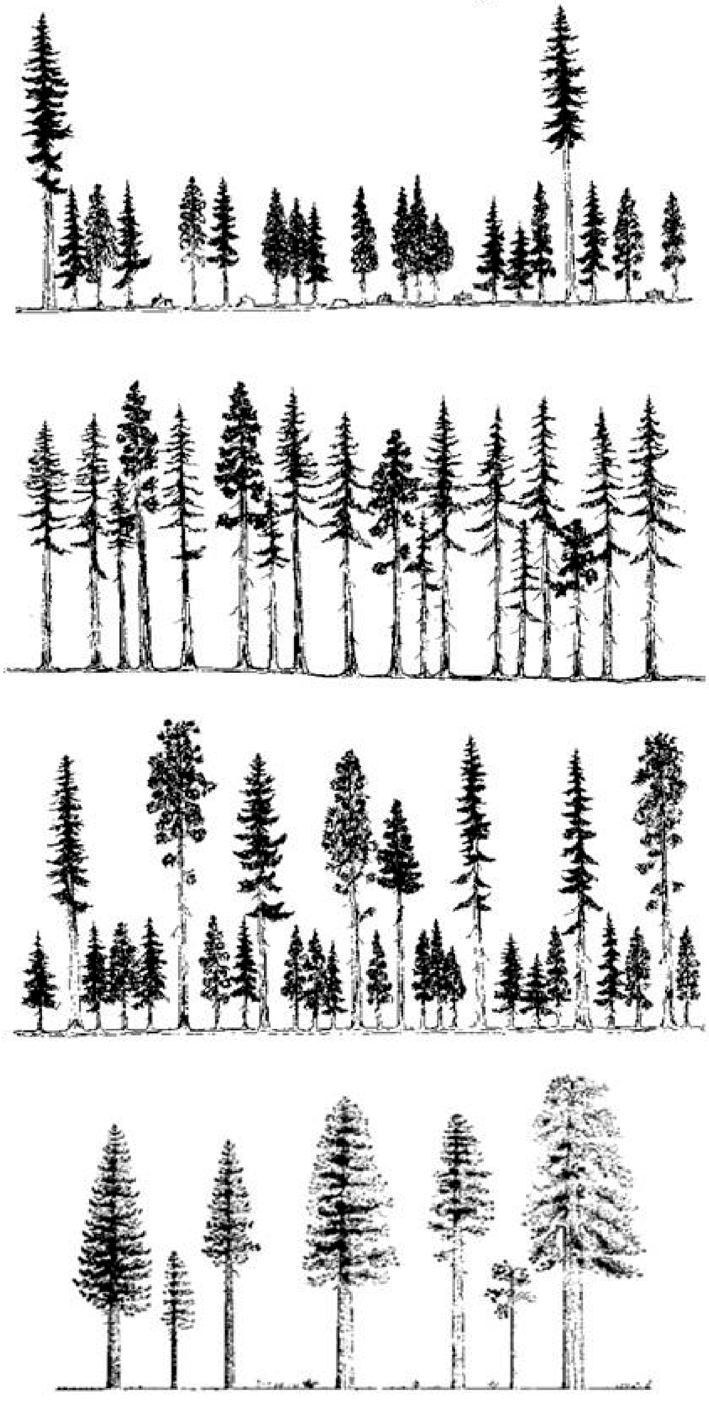
> **Desired Condition:** Healthy, native and desired nonnative animal communities and native and desired nonnative plant communities dominate the landscape and are resilient given current and projected climate conditions. Invasive species and other undesirable species (terrestrial and aquatic plants and animals) are absent or occur in small areas and have limited or no impacts on viability of native and desired nonnative species. Existing invasive and undesirable species do not expand their current distributions over the life of the Plan, and their current distributions will be reduced to the extent possible over that period of time. Invasive and undesirable species do not significantly diminish the ability of the national forest to provide the goods and services that communities expect or the habitat that plant and animal community diversity depends upon. New invasive species resulting from changes in plant and animal habitats due to changes in climate occur only at low levels.
>
> **Scale:** Watershed scale.

1.6 Structural Stages

Background: The structural arrangement of vegetation, both vertical and horizontal, and the size and arrangement of trees, grasses, and shrubs is an important component related to wildlife habitat, insects and diseases, wildfire hazard, scenic integrity, and potential social and economic products, such as timber and culturally significant foods. The structural classes in Table 6 represent the full spectrum of structure from young to old stands.

For forested environments, this includes stand initiation (bare ground to young stands less than 5 inches diameter at breast height, stem exclusion (single layer stands from 5 to 20 inches diameter.), understory reinitiation (multi-storied stands from 5 to 20 inches diameter) old forest multi-story (multi-storied stands with an overstory generally greater than 20 inches diameter), and old forest single-story (single-storied stands with an overstory generally greater than 20 inches diameter) (Oliver and Larson 1996). Figure 4 (next page) describes the various structural stages as does the glossary. These definitions include both size and trees per acre and sometimes include age.

Forested Structural Stages



Stand Initiation (SI): Following a stand-replacing disturbance such as wildfire or tree harvest, growing space is occupied rapidly by vegetation that either survives the disturbance, or colonizes the area afterward. Survivors survive the disturbance above ground or they initiate new growth from underground organs or from seeds on the site. Colonizers disperse seed into disturbed areas, it germinates, and then new plants establish and develop. A single canopy stratum of tree seedlings and saplings is present in this stage. This stage generally includes trees less than 5 inches DBH.

Stem Exclusion (SE): In this single-cohort stand structure, trees initially grow fast and quickly occupy all of their growing space, competing strongly for sunlight and moisture. Because trees are tall and reduce subcanopy light levels, understory plants (including smaller trees) are shaded and grow more slowly. Species needing sunlight usually die; shrubs and herbs may go dormant. In this stage, establishment of new trees is precluded by a lack of sunlight (stem exclusion closed canopy) or soil moisture (stem exclusion open canopy). This stage generally consists of a continuous single layer of trees and can vary from small trees up to those approaching 21 inches DBH.

Understory Re-initiation (UR): As the forest develops, a new age class of trees (cohort) eventually gets established after overstory trees begin to die, or because they no longer fully occupy their growing space. Regrowth of understory seedlings and other vegetation then occurs and trees begin to stratify into vertical layers. This stage consists of overstory trees at a low to moderate density, with small trees underneath. Trees can range in size from 5 – 21 inches DBH.

Old Forest Single-story (OFSS) and Multi-story (OFMS): Many age classes and vegetation layers mark these structural stages containing a predominance of old trees generally larger in diameter. The definition of a large tree varies, depending on the productive potential of the site. Snags and decayed fallen trees may also be present, leaving a discontinuous overstory canopy. The drawing shows a single-layer stand of ponderosa pine, reflecting the influence of frequent surface fire on dry-forest sites (old forest single story OFSS). Surface fire is not common on cold or moist sites, so these environments generally have multi-layer stands (2 or more layers) with large trees in the uppermost stratum (old forest multi-story OFMS).

Sources: Based on O'Hara and others (1996), Oliver and Larson (1996), and Spies (1997).

Figure 4. Description of forest structural stages used to classify vegetation for the Umatilla National Forest plan revision (Justice and Countryman 2006).

Existing Condition: Many changes to forest stand structure have occurred in the Blue Mountains over the last century due to disturbances, such as wildfire, insect or disease outbreaks, timber harvest, fire suppression, and grazing. In many areas, there has been a net loss of larger and older structural stages. The old forest single-story stage, especially within the dry upland forest has been greatly reduced from pre-1900 levels. The amount of old forest within the moist and cold upland forest potential vegetation groups is much closer to being within the range of what occurred historically on the landscape, although there have been shifts from single-storied to multi-storied conditions in many areas.

Some of the most significant changes in forest structural stages have occurred in the dry upland forest environment, which dominates the national forests. Within the dry upland forest, the percent of the potential vegetation group existing in the understory reinitiation stage is now about 50 percent on the Umatilla National Forest. In contrast, within the same dry upland forest potential vegetation group, the percent currently in the old forest single-story structural stage is 4 percent, compared to a historical condition estimated to range between 40 to 65 percent. Most of the reduction in old forest structure occurred prior to 1993, due to harvesting and wildfire. Since then, the primary loss of old forest on National Forest System lands in eastern Oregon and Washington has been due to insects, diseases, or wildfire. Structural classes in the shrubland environment have shifted toward one that has higher levels of older plants primarily due to fire exclusion and grazing.

These changes have led to reductions in habitat for some wildlife species, increases for others, reductions in the output of forest products, and decreases in scenic quality due to the increased occurrences of uncharacteristically severe disturbances (insects, disease and wildfire). Having fewer large diameter old trees has led to decreases in suitable habitat for certain species and fewer stands that are resistant to wildfire. Having more multi-storied stands is also contributing to the increased susceptibility to more severe wildfire.

Desired Condition: The distribution and abundance of forest structural stages creates conditions that are ecologically resilient, sustainable, and compatible with natural levels of disturbance. Table 6 displays the range of conditions representing the desired proportion of each upland forest potential vegetation group existing in each of the forest structural stages. The range of desired conditions reflects the natural variations in the mix of structural stage combinations that would be expected to occur across the landscape over time and which allows for flexibility with regards to addressing other desired conditions.

Table 6. Desired conditions for forest structural stages, described as a percent of each upland forest potential vegetation group

Potential Vegetation Group	Current Total Acres:	Stand Initiation	Stem Exclusion	Understory Reinitiation	Old Forest Single-Story	Old Forest Multi-story
Cold upland	≈ 115,000	20-45	15-30	10-25	5-20	10-25
Moist upland	≈ 430,000	20-30	20-30	15-25	10-20	15-20
Dry upland	≈ 595,000	15-30	10-20	0-5	40-65	1-15

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

Desired Condition: The distribution and abundance of grassland and shrubland structural stages create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. The structural diversity of grasslands and shrublands are characteristic of the settings in which they occur and the disturbance regimes in which they developed. These conditions support the capacity of plants to reproduce and persist on the landscape. Variations in the mix of structural stage combinations across the landscape allow grasslands and shrublands to respond to potential changes in climate. The desired conditions for structural stages include shrubland and grassland potential vegetation groups, as well as grass and shrub layers in forested environments.

Scale: Grassland and shrubland desired conditions should apply at the project scale (minimum of 1,000 acres).

1.7 Plant Species Composition

Forested Vegetation Background: The vegetative species composition within different potential vegetation groups can significantly influence the wildfire, and insects and disease hazards in an area. The shade tolerance of tree species is a measure of a species ability to grow successfully and regenerate in shaded conditions. Common tree species of the Blue Mountains that are more intolerant to shaded conditions include ponderosa pine, lodgepole pine, western larch, and western white pine. Tree species that are relatively tolerant of shade include Engelmann spruce, subalpine fir and grand fir. The variety of Douglas-fir found in the Blue Mountains region is generally considered intermediate along the shade tolerance continuum, more tolerant of shade than ponderosa pine, but much less tolerant of shade than its common associate, grand fir. Common shade intolerant tree species like ponderosa pine and western larch, as well as the intermediate Douglas-fir, tend to be better adapted to low severity surface fires and they exhibit greater tolerance to drought conditions. Conversely, shade tolerant species like grand fir or subalpine fir are generally associated with a high susceptibility to defoliators, root diseases, fir engraver beetle, stem decay, and other insects or disease agents. Drought and excessive stocking often exacerbate mortality caused by these agents. Much of the perceived increase in insect and disease activity and increasing vulnerability to stand replacing wildfire within the dry upland forest is related to the increased proportion of grand fir across the landscape.

Shade tolerant species like grand fir can regenerate and grow underneath overstories of more mature trees. In the absence of the natural thinning and weeding effect of low severity surface fires, the dense multi-layered structure that often results can greatly increase the potential fire behavior. Species composition can also influence landscape diversity, scenic diversity, and the availability of socially desired products. Desired ranges of species composition were developed using a model that simulated the development of historical tree species compositions that would likely develop under more natural disturbance regimes. The desired species compositions should represent forest conditions that are more sustainable into the future.

Existing Condition: In the Umatilla National Forest, many landscape and forest stand-level species compositions have been modified by past harvests, which removed large ponderosa pine, western larch, Douglas-fir and western white pine. The exclusion of wildfire and past grazing practices have also contributed to a significant shift away from fire and drought tolerant tree species, as well as the introduction of invasive plant species (Stine et al. 2014). There have been significant increases in the distribution of grand fir (Hessburg et al. 1999). The abundance of juniper has increased on many sites that were historically dominated by sagebrush. The distribution of aspen has decreased and the recruitment of younger aspen trees is declining due to conifer encroachment, browsing, and the exclusion of wildfire. Whitebark pine has decreased due

to white pine blister rust, mountain pine beetle mortality, and possibly competition with subalpine fir. Western white pine, although common in small localized areas, has a limited abundance at the larger landscape level. This level of white pine at the landscape level is largely consistent with estimated historical levels.

Within the dry upland forest potential vegetation group, the proportion of the group dominated by shade-tolerant species ranges from 24 to 55 percent, compared to a desired condition of 5 to 20 percent. Changes such as this in the existing species composition have created a landscape that is more susceptible to larger scale uncharacteristic disturbances and less resilient to natural disturbances and climate change than what is desired.

> **Desired Condition:** The mix of tree species composition across the landscape creates conditions that are ecologically resilient to natural disturbance regimes and are sustainable over the long-term. Early seral species such as ponderosa pine, Douglas-fir and western larch are the primary tree species in locations characterized by frequent fires and drought stress. Shade tolerant species (e.g., grand fir, Engelmann spruce, subalpine fir) are more dominant in areas characterized by lower fire frequency and less moisture stress. A site appropriate mixture of species is promoted and maintained to mitigate the risk that any single type of insect or disease agent can cause severe damage across extensive areas. Sites that historically have had the potential to support forested vegetation and are likely to maintain that capability in the future, given regional climate projections, are occupied by tree stands within the ranges displayed in Table 7. The table displays the desired proportion of each upland forest potential vegetation group in each of the dominant species composition classes. The range of desired proportions allows for variations in the species composition across the landscape to respond to potential changes in climate or other management goals.

Table 7. Desired conditions for species composition, described as a proportion of each potential vegetation group with the following dominant species

Potential Vegetation Group	Shade-intolerant Dominant Species Composition	Intermediate-tolerant Dominant Species Composition	Shade-tolerant Dominant Species Composition
Cold upland forest Current Total Acres ≈ 115,000	40 to 60% (preferred dominant species include western larch, western white pine, whitebark pine, lodgepole pine)	5 to 20% (preferred intermediate tolerant species include Douglas-fir)	25 to 50% (preferred tolerant species include Engelmann spruce, subalpine fir, grand fir)
Moist upland forest Current Total Acres ≈ 430,000	30 to 60% (preferred intolerant species include western larch, western white pine, ponderosa pine, lodgepole pine)	20 to 40% (preferred intermediate tolerant species include Douglas-fir)	10 to 30% (preferred tolerant species include grand fir, Engelmann spruce, subalpine fir)
Dry upland forest Current Total Acres ≈ 595,000	75 to 90% (preferred intolerant species include ponderosa pine, western larch)	Not applicable	5 to20% (preferred tolerant species include grand fir; preferred intermediate tolerant species include Douglas-fir)

The mix of species in the grass and shrub layer of forests, as well as shrubland and grassland vegetation, contain a diverse array of native species distributed across the landscape reflecting historical conditions. Perennial native bunchgrasses dominate grasslands and shrublands. Native grasses, grass-like plants (sedges and rushes), forbs and various shrubs characterize the forest understory. Riparian zones consist of meadows with obligate wetland species including native grasses, sedges and rushes, hardwoods, and structurally diverse riparian shrublands.

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate though project analysis.

Grazing Land Vegetation Background: Grazing lands provide forage for wildlife, permitted livestock, and wild horses, as well as habitat for a wide variety of other animals and plant species, including rare or unique plant species and communities. Grazing lands and associated plant communities also provide important watershed values, including soil protection, high quality water storage and slow release, and biodiversity. Other intrinsic values associated with rangelands include maintenance of open space, visual beauty, and areas for recreational activities.

Johnson and Swanson (2005) classify vegetation along a gradient of increasing departure from pristine, native vegetation (reference conditions). Phases A to C are used to describe the distinctive plant communities in a state close to reference, which represents the historical range of vegetation dynamics of a site. Phase A is the most resilient plant community within that state and depicts reference conditions. Phase B shows moderate departure from reference conditions. Phase C is strongly departed from reference conditions. This is the at-risk phase, which is the least resilient and most vulnerable to transition to an alternate state. Sites with vegetation conditions completely departed from reference are classified as Phase D. This phase represents various alternate states possible for a site. Transitions to alternate states can be caused by grazing, alteration of water tables through mining or irrigation, cultivation, fire suppression and other large disturbances. It is important to note that sites in Phase D may still fulfill many ecosystem functions such as forage production and erosion control and may, with additional disturbance, transition to a different and possibly less desirable alternate state (Final Environmental Impact Statement, Volume 1, Issue 3: Livestock Grazing and Grazing Land Vegetation, Analysis Assumptions).

Existing Condition: A variety of past activities, such as livestock grazing, mining, and logging have significantly altered rangelands and forestlands. Many of these activities predate the establishment of national forests and have lasting effects on the structure and composition of vegetation cover.

In the Blue Mountains, the majority of the forage is produced in forestland sites. Within the Umatilla National Forest, distribution among forest grazing lands phase groupings are 94 percent in Phases A and B (see Table 8).

The general condition of rangelands appears more departed from reference conditions than forestlands. Within the Umatilla National Forest, Phases A and B rangelands account for 43 percent of rangeland (see Table 8). As with the forest grazing lands, most of the Phases C and D rangelands may be the result of activities that pre-date the establishment of the Umatilla National Forest. Whether these sites have crossed a threshold and transitioned to an alternate state or not has to be analyzed on a case-by-case basis.

Table 8. Summary (acres) of current vegetation survey plot phases for the existing condition for the Umatilla National Forest

Phases	Acres
A or B forest grazing land	535,800 (94%)
C or D forest grazing land	34,200 (6%)
Total forest grazing land	**570,000**
A or B rangeland	98,400 (43%)
C or D rangeland	141,600 (57%)
Total rangeland	**240,000**

Desired Condition: Rangelands reflect native or desired nonnative plant composition and cover at near-natural levels as defined by the site potential.

The diversity of vegetation in grass and shrub layers contains an array of native species distributed across the landscape reflecting historical conditions. Perennial native bunchgrasses dominate many grasslands and shrublands. Native grasses, grass-like plants (sedges and rushes), forbs and various shrubs characterize the forest understory. Riparian zones consist of meadows with obligate wetland species including native grasses, sedges and rushes, riparian hardwoods and structurally diverse shrublands.

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified though project analysis as more appropriate.

Desired Condition: The distribution and abundance of vegetation density within grasslands and shrublands create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes. These conditions support the capacity of the grassland and shrubland plants to reproduce and persist on the landscape. Variations in the mix of vegetation density combinations across the landscape allow grasslands and shrublands to respond to potential changes in climate. The desired conditions for vegetation density include shrubland and grassland potential vegetation groups, as well as grass and shrub layers in forested environments.

Scale: Grassland and shrubland desired conditions are applied at the project scale (minimum of 1,000 acres).

1.8 Stand Density

Background: Stand density refers to the degree to which an area is occupied by trees and the intensity by which trees are competing for site resources (Tappeiner 2007). Stand density is important as it directly relates to the availability of limited resources that are critical in terms of both stand-level productivity and individual tree vigor. It is also important in terms of wildfire behavior, wildlife habitat, and insect and disease disturbances. For example, very high stand density tends to spread the available growing space among too many individual trees. The result is that many trees become stressed and decline in vigor. Stress also reduces the ability of a tree to resist insects and diseases and increases the likelihood of mortality. However, some wildlife species depend on the relative security of either dense stems and foliage or interlocking overstory canopies to rear young and escape predators. Stand density relationships to potential fire behavior can be complex. Higher density (e.g., more fuels) forest stands typically correlate to greater potential for severe fire behavior.

Stand density can be described or quantified in many ways; strictly speaking, it is an absolute measure of tree occupancy per unit area, commonly expressed as trees per acre. Relative density is a concept that is important to forest managers, as it is used to gauge the degree of competition between trees relative to some implied biological limit or "carrying capacity" (Kimmins 2004). The broad-scale analysis and modeling done in support of this Forest Plan used canopy cover to characterize stand density. Canopy cover is somewhat different from stand density, as it is the proportion of the ground covered by a vertical projection of the tree canopy (Jennings et al. 1999). Tree size and numbers are not a direct part of this measure, but canopy cover correlates with the idea of relative site occupancy. It has the added advantage of being readily estimated by remote sensing techniques used in large-scale forest inventories. Canopy cover can also be indirectly estimated using attributes commonly collected during detailed ground examinations. Within the dry upland forest potential vegetation group, high stand-density conditions were defined as those stands having 40 percent canopy cover or greater. Within the moist and cold upland forest potential vegetation groups, high stand density conditions were defined as those stands having 60 percent canopy cover or greater. Stands with canopy covers less than these thresholds were categorized as having low density.

Prior to Euro-American settlement, dry upland forests of the Northwest like the ones found in the Blue Mountains region were burned by frequent low- or mixed-severity fires (Johnston 2016, Heyerdahl and Agee 1996, Agee 1993). The result was that these fires, which burned mostly on the surface, maintained low and variable tree density stand conditions throughout most of the dry upland forest (Hessburg et al. 2005). The historical range of variability analysis completed to support this Forest Plan estimated that 80 to 90 percent of the dry upland forest would be expected to exist in open stand density conditions if natural disturbance regimes and ecological processes were functioning. The moist and cold upland landscapes were likely predominantly closed density stands, but a portion of those vegetation groups may have existed in a low-density condition.

Existing Condition: Decades of wildfire suppression and exclusion, domestic livestock grazing, and timber harvesting have interacted to alter the structure, composition, and disturbance regimes of the Umatilla National Forest. The dry upland forest has become much denser. Approximately 70 percent of the dry upland forest is characterized as being closed-density compared to an estimated 10 to 20 percent historically. A study compiled by Stine et al. (2014) indicates that current trees per acre density of the dry forest in northeast Oregon is on average about 2.5 times higher than historical conditions. The same study shows that within the moist mixed-conifer forest trees per acre are about 2 times as high. Large landscapes of dry forest are now much more uniform in their composition and dense structure, and these density changes have contributed significantly in shifting disturbance regimes toward less frequent, but larger and more severe disturbance events. The existing dry upland forests no longer appear or function as they once did.

> **Desired Condition:** Vegetation densities across the landscape create conditions that are ecologically resilient, sustainable, and compatible with desired levels of disturbance processes.
>
> For each forested potential vegetation group, the proportions of stands existing in low or high-density conditions on the landscape occur within the ranges indicated in Table 9 below. The range of desired conditions reflects the natural variations in the mix of stand density conditions that would be expected to occur across the landscape over time, and allows for flexibility with regards to addressing other desired conditions. Stands representing the full range of density conditions possible within each of the broad

categories defined as low or high occur and are well distributed across the landscape. Appropriate levels of fine scale variability in density exist within stand-level units.

Table 9. Desired conditions for forest stand density, described as a percent of each upland forest potential vegetation group.

Potential Vegetation Group	Low Stand Density	High Stand Density
Cold upland forest	20-30	65-80
Moist upland forest	30-40	60-80
Dry upland forest	80-90	5-20

Dry upland forest high stand density is 40 percent canopy cover or greater.
Cold and moist upland forest high stand density is 60 percent canopy cover or greater.

Scale: Fine scale variability in density is analyzed at the stand-level. Overall, potential vegetation group desired conditions are relevant at the minimum scale of subwatershed; the scale may be changed to watershed or subbasin level if justified through project analysis.

1.9 Air Quality

Background: Air quality describes the state of the surrounding air at any given time and is measured by the concentration of pollutants that are known to be harmful to the health and welfare of people and the environment. Air quality is regulated by the States under the authority of the Clean Air Act (1970). Amendments to the Act in 1977 established goals for preventing impairment of visibility in larger wilderness areas and National Parks in existence at the time, placed controls on particulate emissions, and established monitoring requirements. Human sources of air pollution include industrial emissions, energy production and generation, automobile exhaust, and smoke from agricultural field burning, wildfires, and prescribed fires. Regulated pollutants include smoke, particulate matter, nitrogen oxides, sulfur dioxides, carbon monoxide, numerous volatile organic chemical compounds, and metals, including lead and mercury. Air pollutants can be further portioned into global sources that circulate with prevailing winds in the northern hemisphere and local or regional sources that may impact the Umatilla National Forest from some distance, depending on prevailing wind and weather patterns.

Smoke, including fine particulate emissions from wildland fire (planned and unplanned ignitions), results in reduced visibility and haze at lower concentrations and can be hazardous to human health at moderate concentrations. Federal and State standards include protection of air quality-related values in Class I areas (wilderness areas greater than 5,000 acres that existed on or before August 1977; on the Umatilla, this includes Wenaha-Tucannon, North Fork John Day, and North Fork Umatilla Wilderness Areas).

The primary national forest activity in the Umatilla National Forest influencing air quality is smoke production from wildfires and prescribed fires. Wildfires are recognized as a natural part and a recurring process in fire-dependent ecosystems. Some of the primary objectives of managed fuel reduction activities are to reduce the total amount of annual smoke emissions otherwise brought about by wildfires, to reduce the risk of high-severity and high intensity wildfires, and to lower the potential of smoke impacts to local communities and other smoke-sensitive areas. In compliance with the Clean Air Act, smoke emissions from prescribed burning and fuels reduction projects on National Forest System lands are regulated through State Implementation Plans and Smoke Management Plans in Oregon.

Air quality monitoring is accomplished through national, regional, and local monitoring, and includes measurement of visibility, particulates, acid deposition, and water chemistry (in lakes), biomonitoring of lichens, and deposition of nitrogen, sulfur compounds, and heavy metals, including mercury.

Existing Condition: Smoke emissions from wildfires can vary greatly from year to year, while annual smoke emissions from prescribed fires are less variable. Both have the potential to affect local community and regional air quality.

> **Desired Condition:** National forest air quality complies with national and State (Oregon and Washington) ambient air quality standards and State air quality and smoke management plans (ODF 2014; WA DNR 1998). Air quality within the national forest is sufficient to protect the environment, human health, and safety.
>
> Air quality in Class I wilderness areas is consistent with Clean Air Act regulations and meets applicable state and Federal air quality standards.
>
> **Scale:** Smoke emissions are relevant at the scale of the Blue Mountains as well as at local air sheds surrounding local communities and the broader areas that encompass designated wilderness.

1.10 Soil Quality

Background: Soils develop over long time periods (from decades to centuries), depending on local site characteristics. Five variables are involved in the development of soil: (1) climate, (2) the nature of geological parent material (rock type), (3) the actions of living organisms (including vegetation, soil organisms, and microbes), (4) topography, and (5) weathering and decomposition processes (Brady 1990, Harvey et al. 1994). The biological, physical, and chemical properties of soils contribute to both the biological productivity of plant communities and the hydrologic functioning of watersheds. In addition, soils likely store as much carbon as is contained in above ground vegetation and are therefore important when considering the effects of climate change.

The five soil forming factors help us understand the soils developmental process. The system of soil classification used by the National Cooperative Soil Survey, has identified 12 soil orders that are the highest level used to classify all soil types. The Blue Mountains possess 5 of the 12 soil orders. They are, in the order of those that are typically the most stable to the most erosive: Mollisols, Alfisols, Andisols, Inceptisols, and Entisols.

- Mollisols (from the Latin mollis – soft) are most often prairie or grassland soils with a dark-colored surface horizon. They are highly fertile and rich in chemical “bases” such as calcium and magnesium. The dark surface horizon comes from the yearly addition of organic matter to the soil from the deep roots of prairie plants. Mollisols are often found in climates with pronounced dry seasons.
- Alfisols (from the soil science term Pedalfer – aluminum (Al) and iron (Fe)) typically form beneath hardwood forest cover; have a clay-enriched subsoil and have relatively high native fertility (Al and Fe); and are found in temperate humid or subhumid regions.
- Andisols (from the Japanese ando – black soil) typically form from the weathering of volcanic materials such as ash, resulting in minerals in the soil with poor crystal structure. These minerals have an unusually high capacity to hold both nutrients and water, making these soils very productive and fertile. Andisols include weakly weathered soils with much volcanic glass, as well as more strongly weathered soils. They typically occur in

areas with moderate to high rainfall and cool temperatures and they also tend to be highly erodible when on slopes.

- Inceptisols (from the Latin inceptum – beginning) exhibit a moderate degree of soil development and lack significant clay accumulation in the subsoil. They occur over a wide range of parent materials and climatic conditions, and thus have a wide range of characteristics.
- Entisols (from recent – new) are the last order in soil taxonomy and exhibit little to no soil development other than the presence of an identifiable topsoil horizon. These soils occur in areas of recently deposited sediments, often in places where deposition is faster than the rate of soil development. Some typical landforms where Entisols are located include active flood plains, dunes, landslide areas, and behind retreating glaciers.

These soil orders are referenced to the soil series mentioned in the land type associations mapped in the Blue Mountains Ecoregions (USDA Forest Service 2006, Table 8). This mapping is a broad generalization of the soil mapping available. Mapping with greater detail (Terrestrial Ecological Unit Inventory) has been published for the Umatilla National Forest. For the sake of consistency, the land type associations are used to delineate the soils within the Blue Mountains. The generalized mapping in the land type associations identifies four soil orders, while most of the Entic, Inceptic and Alfic soils are common to forested ecosystems; Mollic soils typically developed under an ecosystem dominated by grasses.

Defined as having a high base saturation and high organic content (USDA 2010), Mollisols can develop under a forested environment but only if topographic features allow organic matter accumulations (i.e., wetlands or stands on a concave surface) and the forest species, like deciduous trees, can help build organic accumulations. Given this limitation, we can infer that Mollisols in the Blue Mountains present on convex surfaces (ridge and shoulder slope positions) or linear (flat or mid-slope) landforms developed under a grass-dominated condition. Despite their grassland development, some of these Mollisols currently support forested conditions, so it is probable these stands have encroached on the previously sparsely timbered open savannah.

Surface soil erosion and sediment delivery to streams are common contributors to reduced water quality (Coats and Miller 1981). Sediment in streams can increase water treatment costs where water is used for human consumption (Forster et al. 1987) but is more commonly known for effects on aquatic habitats (Bisson and Bilby 1982, Bjornn and Reiser 1991, Cordone and Kelley 1961, Waters 1995).

High-intensity wildfires may result in elevated post-fire water temperatures (Dunham et al. 2007), channel incision (Moody and Kinner 2006), greatly elevated erosion rates (MacDonald and Robichaud 2008, Shakesby and Doerr 2006) and loss of soil carbon and nitrogen (Bormann et al. 2008).

Existing Condition: The quality of soils across the Blue Mountains has been affected to varying degrees by past land uses, such as livestock grazing, timber harvesting, road construction, mining, wildfire suppression, off-highway vehicle use, and the subsequent introduction of nonnative plant species from any one or more of the activities mentioned above. The effect of these activities can be reduced ground cover, altered vegetative conditions, increased soil erosion rates, and reduced soil productivity and hydrologic function.

Some forest stands are growing on soils developed under non-forest conditions and are currently managed at densities that may be unsustainable under projected climate variations (i.e., those developing on Mollisols). The concept of forested unsustainability within Mollisol development

is closely associated with soils that range from shallow to very shallow in depth or have some other root limiting factors. Moderately deep soils, which are not uncommon in Mollisols, may allow for some buffering capacity against the effects which make them otherwise unsuitable and/or unsustainable for forests (i.e., in drought conditions). Deep and very deep Mollisols have both the nutrient capacity and may have the needed moisture capacity to support timber and grasslands sustainably. Shallow Mollisols may have the nutrient capacity to support timber stands; however, these soils, when considering predicted and extended drying trends, may not be suited for densely forested conditions.

> **Desired Condition:** The productive potential of forest and range soils is maintained at levels that contribute to long-term sustainability of ecosystems considering the range of possible climate change scenarios. Soil physical and chemical properties (texture, porosity, strength, coarse fragment content, and fertility) and organic matter (surface woody debris, humus) are at levels that maintain potential soil productivity and hydrologic function (infiltration, percolation, and runoff).
>
> Surface erosion rates and sediment deposition are within the natural range of variability for each biophysical setting, with an appropriate amount of effective ground cover as specified in best management practices in the form of live and dead vegetation.
>
> **Scale:** Subwatershed to watershed depending on the severity of the disturbance regime

1.11 Water Quality

Background: Water quality is regulated nationally by authority of the Clean Water Act. Water quality criteria are established by the individual States and some Tribes for the protection of aquatic species and humans. Water quality criteria vary depending on the beneficial use of water. For example, the criteria for irrigation use, domestic use, and cold water fisheries are all different.

For aquatic species, water quality concerns include elevated stream temperature, elevated fine sediment levels, and the availability of nutrients on which aquatic food webs are based. Rivers that originate from within the Umatilla National Forest are used for irrigation of agricultural crops, recreation, and for human consumption.

Existing Condition: Surface water on National Forest System lands in the Umatilla National Forest is designated for a variety of beneficial uses including, but not limited to recreation, irrigation, domestic and municipal water supplies, livestock watering, salmonid spawning and rearing habitat, and core cold water habitat. As specified in the Clean Water Act, both Oregon and Washington require protection of the most sensitive use. Within the Umatilla, the most sensitive use is often one or more aquatic species that may vary seasonally depending on the use and the species affected. In the Blue Mountains, more than 1,200 national forest stream miles are listed as not meeting water quality criteria for this use due to elevated stream temperatures. Fewer than 100 stream miles are listed due to excess stream sedimentation. The flow regimes of many streams are affected by dams and water diversions. Removal of instream wood, changes in channel morphology, loss of floodplain connectivity, and alteration and loss of riparian vegetation all contribute to declines in water quality.

> **Desired Condition:** Water quality (e.g., temperature, turbidity, and dissolved oxygen) of surface and groundwater is sufficient to support healthy riparian, aquatic, and wetland ecosystems. It is within the range that maintains the biological, physical, and chemical integrity of the system and benefits the survival, growth, reproduction, and mobility of individuals composing aquatic and riparian communities.

The quality of water emanating from the national forests is sufficient to provide for state-designated beneficial uses, including human uses.

Water quality in streams within the Umatilla National Forest is sufficient to meet applicable State, local, and tribal water quality criteria.

Scale: Forest-wide.

1.12 Landscape Patterns

Background: Landscape pattern, also referred to as landscape heterogeneity, is the emergent patchiness of landscapes and the variability occurring among the types of patches that results from characteristic disturbance processes, their variability, and succession. Landscape patterns can vary as a function of species composition, tree age, density, and layering structure. Landscape heterogeneity can occur at multiple spatial scales (Benton et al. 2003), from tree clumping patterns within patches to broad patterns of patches that correspond with major topographic and elevation features. Landscape heterogeneity that resembles natural patterns resulting from characteristic fire regimes has been shown to provide for a richer more resilient biodiversity (Fischer et al. 2006), and it tends to more strongly support the characteristic fire regime.

Landscapes are ecological land units having variable structure, composition, and function. They are composed primarily of patches of vegetation that differ in size, shape, dynamics, origin, and ecosystem processes (Farina 2013). Landscape patterns can influence disturbance processes, nutrient cycling, and plant and animal distribution (Gosz et al. 1999). Landscape patterns determine how, where, and when vertebrate and invertebrate species utilize a given area. Landscape patterns influence the movement of species across the landscape.

Landscape patterns are initiated by vegetation interactions with soil, landform, and their relations with temperature, precipitation, and solar radiation gradients across landscapes. Within these basic elements: plants, animals, fungi, and bacteria inhabit the region and shape and modify their environment, creating even more complex patterns. Onto those patterns, different types and intensities of disturbance, discussed in Section 1.4, continually reshape the landscape. Landscape patterns are heavily influenced by the timing and characteristics of recurring disturbances, which are classified according to their “disturbance regimes.” Disturbance regimes differ in their frequency, intensity, seasonality, distribution, and extent. Landscape patterns and the associated disturbance processes determine the degree of dead wood structure that may occupy a site, nutrient cycling dynamics, and plant and animal distribution.

The essential dynamic of a landscape is a constantly shifting mosaic of vegetation patches. Some changes are sudden, such as after fires. Other changes are slow, taking place over decades (i.e., resulting from succession processes). Some of the most durable are those that take place over thousands of years (i.e., soil formation) or the way species evolve to fit distinct habitat or climatic niches.

A key concept is that although landscapes are made up of shifting patterns, in many ways their biotic content can be relatively stable in the absence of large disturbances, especially when the climate is relatively constant, or when climate variation is limited. When climatic variation is large, so is the variability of landscape patterns. Within the patterns of landscapes, there is normally a predictable range of variation in: (a) stand structure and stand densities, as described in the desired conditions for Section 1.6 and 1.8; (b) the number and types of species and their abundance (desired conditions for Section 1.7); (c) the ways natural communities form and the ways they cycle energy and nutrients through air (desired conditions for Section 1.9), soil (desired

conditions for Section 1.10), and water (desired conditions for Section 1.11). What remains the same in the shifting mosaic of landscape patterns is how natural communities both influence and respond to disturbance regimes (desired conditions for Section 1.4) and the way these dynamics create recognizable patterns that repeat across the landscape over time. Terrestrial and aquatic species diversity (desired conditions for Section 1.2) are highly correlated with diversity of landscape patterns.

Existing Condition: Issues of landscape patterns are well studied and described within the science of landscape ecology (Turner and Gardner 2015). Hann et al. (1997) found that when land use, ecosystem health, and species diversity are disconnected from the disturbance regimes, the landscape ecosystem develops characteristics that are atypical. Subsequent results are that biodiversity and productivity may decline and disturbance regimes change, often from regular low intensity disturbances to irregular high intensity disturbances. In the Blue Mountains, Hemstrom et al. (2001) show that in the recent past human uses caused extensive changes to landscape patterns. These changes resulted in substantially atypical patterns from those that existed historically. This includes altered patch size distributions, patch shape and connectivity, stand structure, density, and composition which have resulted in altered fire and insect disturbance regimes (Hessburg et al. 2000).

Fire-prone forests are historically dry, mesic, or cold interior forest types that depend on wildfires for regeneration and succession (Hessburg et al. 2015). For example, patch size and structure for dry forests has become more uniform and often more continuous and larger than was present historically. Conversely, for moist forests, patches have become smaller and more fragmented, but are also less diverse than they were historically (Quigley and Arbelbide 1997). Past timber harvest practices may have played a role in creating these changes. For instance, the percentage of forest patches less than 40 acres in size has likely increased significantly as a result of the National Forest Management Act requirement, which limits the size of regeneration harvests to less than 40 acres. Since 1986, larger and more severe wildfires have contributed to an uncharacteristic landscape pattern, one that is outside of the natural range of variation (Haugo et al. 2015). This condition occurs mostly in landscapes that are actively managed, as compared to areas that are not actively managed, such as in wilderness areas. For example, Hann et al. (2003) found that the extent of fragmentation and homogenization of patches are substantial within the Columbia River Basin. Here, the highest departure of fragmented landscapes from natural conditions occurs in lower elevation watersheds. Watersheds that are the least departed from natural conditions occur at higher elevations, primarily in wilderness.

> **Desired Condition:** Regional landscapes function as multi-level, cross-connected, patchwork hierarchies with patterns and processes that interact across spatial scales; the historical, multi-level landscape patterns, processes and dynamics (Hessburg et al. 2015) exist across the national forest. Forest vegetation is within the range of variability of disturbance and successional patterns as caused by fire, insects and diseases, and weather without a decline in soil or vegetation productivity, biodiversity, or in water quantity and quality.
>
> Landscape-scale patterns of forest types include areas of different stages of succession, from recently disturbed to early regeneration, mid-stage regeneration, mature, old and decadent. Cross-connected landscape patches provide quality forage, cover, and security as viable species move through porous landscapes. Landscape patterns provide connectivity, facilitating the movement of wildlife across landscapes.

The Umatilla National Forest contributes basic landscape patterns across vary from high elevation cold forest types to middle elevation moist forests, and low elevation dry forests and dry woodlands across the Blue Mountains. Cold forests generally occur in large patches mixed with small to medium sized openings of shrublands, wet meadows, and rocky outcrops. Moist forests tend to occur across large contiguous extents with few non-forest breaks or openings. Importantly, moist and dry forest types tend to overlap along a moisture gradient. The landscape patterns formed in the transition zone between moist and dry forests is often fine grained and complex, resulting in large amounts of edge between these forest types. Dry forests are made up of highly diverse landscape patterns. Dry forests consist of a wide range of forest patch sizes and shapes, from areas populated by many small clumps of trees and larger areas of more continuous dry forest with scattered small grassland openings intermingling with large swaths of grasslands and shrublands. Dry woodlands tend to be a sparser expression of the dry forest types.

Scale: Desired conditions for landscape patterns apply at multiple scales ranging from subwatershed (HUC-6) to forestwide extents.

1.13 Special Plant Habitats

Background: Special habitats are unique groups of living organisms or inanimate features that are limited in geographic extent, such as legacy trees, caves, cliffs, talus slopes, specific plant communities (i.e., aspen, whitebark pine, sagebrush steppe, etc.) and soil types. Oregon and Washington have completed conservation strategies (ODFW 2006a, WDFW 2005). Both State strategies identify rare habitats and specialized areas that occur within the Blue Mountains, as well as conservation actions.

A wide variety of special habitats occurs across the Blue Mountains, and these habitats are important for sustaining ecosystem function. Some special habitats result from or are affected by disturbances. Other special habitats, such as rock outcrops, may be indirectly affected by disturbance. Depending on the extent and intensity of the disturbance, many special habitats may be created or are transitioned to a different ecological state.

On the Umatilla National Forest, special habitats include, but are not limited to mountain mahogany, aspen, cottonwood, sagebrush steppe, and whitebark pine. Some of the special habitats are associated with water and riparian areas (i.e., wetlands, waterbodies, springs, fens, seeps, and bogs). These types of special habitats are discussed in Section 1.1 Watershed Function. Special habitats tend to be small in area and localized in distribution.

Desired Condition: Special plant habitats include mountain mahogany, aspen, cottonwood, sagebrush steppe, and whitebark pine. They provide high quality habitat for associated species. The distribution and abundance of structural stages and vegetation density classes within these special plant habitats are consistent with their natural range of variability and create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. Variations in the mix of structural stages and vegetation density combinations across the landscape allow special plant habitats to respond to potential changes in climate.

Scale: The desired condition for special plant habitats can be applied at a variety of scales identified by species (i.e., national forest, watershed, subwatershed, or fine-scale stand-level).

The identification and protection of special aspen plant habitats are primarily accomplished at project level planning. The sustainability of special plant habitats is best

addressed at the forestwide scale utilizing consideration of the best available climate projections.

1.13.1 Whitebark Pine

Background: Whitebark pine has been widely described as a “keystone” species in high-elevation forests (Tomback et al. 2001, Schwandt 2006). As an important ecosystem component that influences the success of other organisms, it plays a vital role in first colonizing areas disturbed by fire or landslides, stabilizing the soil, moderating snowmelt, and providing the cover that allows regeneration of other tree species. Seed dissemination by whitebark pine is unique among American pines. The species’ large, wingless seeds are rarely if ever spread by wind or gravity. Instead, whitebark pine seeds are mostly released from cones and disseminated by a bird species, the Clark’s nutcracker. Many other wildlife species of high-elevation ecosystems depend to varying degrees on whitebark pine seeds as food resources (Lanner 1996). Two species of squirrels, the red squirrel and the Douglas squirrel, harvest large numbers of whitebark pine cones in good seed years and store them in midden piles for winter food (Lanner 1996; Mattson et al. 2001).

Existing Condition: On July 18, 2011, the U.S. Fish and Wildlife Service determined the whitebark pine warrants protection under the Endangered Species Act, but that adding the species to the Federal List of Endangered and Threatened Wildlife and Plants is precluded by the need to address other listing actions of a higher priority, thus making it a Federal Candidate species. The four major threats to whitebark pine identified in the Whitebark Pine Restoration Strategy for the Pacific Northwest (Aubry et al. 2008) include habitat loss and mortality from the nonnative fungus (white pine blister rust), mountain pine beetle, uncharacteristic fire associated with past fire exclusion, and environmental effects associated with climate change. The inadequacy of existing regulatory mechanisms also plays a role. Since its introduction in the U.S., white pine blister rust has caused unprecedented decline and mortality of whitebark pine in the Inland Northwest. Between 2005 and 2007, an estimated 600,000 whitebark pines were killed by mountain pine beetles in Washington and Oregon (Aubry et al. 2008). In some cases, the alteration of natural fire regimes due to active suppression has led to replacement by more shade tolerant tree species. These encroaching tree species tend to promote uncharacteristic large high-severity fires with the potential to severely reduce or eliminate cone-bearing whitebark pines across extensive landscapes.

> **Desired Condition**: The distribution and abundance of whitebark pine structural stages, age classes and density classes are consistent with their natural range of variability. Whitebark pine habitats are ecologically resilient, sustainable, and compatible with natural disturbance processes. Whitebark populations and the threats to those populations exist at levels that do not warrant protection under the Endangered Species Act. Whitebark pine is unaffected by invasive pests or diseases.
>
> **Scale**: The desired conditions for whitebark pine special plant habitats can be applied at a variety of scales identified by species (i.e., national forest, watershed, subwatershed, or fine-scale stand-level).

1.13.2 Aspen

Background: Although quaking aspen occurs in a wide variety of habitats (including soil type and moisture conditions) and at a great range of elevation throughout northern and western North America, stands of quaking aspen are an uncommon and unique habitat type in the Blue Mountains. Wildfires normally revitalized aspen clones, with some patches sprouting 10,000 to

20,000 stems per hectare (24,710 to 49,421 stems per acre) in early life stages after fires. Ungulate browsing, both wild and domestic, and a host of stem cankers, foliar diseases, and insect defoliators would naturally thin aspen clones to one or two hundred stems per acre after several decades (Stine et al. 2014). As one of the few broadleaf deciduous trees in a region dominated by conifers and semi-desert grassland and scrub, aspen brings important diversity to the landscape. Aspen's palatable twigs and foliage, and tendency to develop cavities, make it valuable habitat for wildlife such as deer, elk, woodpeckers, beaver, songbirds, and small mammals. Aspen grow in moist sites such as topographic depressions, seeps, springs, lake margins, and often in riparian areas, providing shade, streambank stability, and nutrients from leaf-fall to streams. Aspen are also appreciated for their scenic value, especially their golden colors in the fall (Swanson et al. 2010).

Existing Condition: In the Blue Mountains of northeast Oregon, quaking aspen exists as small, scattered, remnant stands of rapidly declining trees. Although little is known about the historical distribution of aspen in Oregon, it is believed that stands were once larger and more widely distributed. The two main reasons for the decline are believed to be browsing pressure and shading or replacement by conifers in the absence of fire or some other natural disturbance (Shirley and Erickson 2001). Small clonal aspen patches, often imbedded within mixed-conifer forests, have been heavily affected by fire exclusion owing to their relatively short life expectancy (stands begin to deteriorate at 55 to 60 years of age and are pathologically old and decadent at 90 to 110 years (Stine et al. 2014). While aspen root systems may persist for thousands of years, aspen trees have an average lifespan of between 100 and 150 years in the Rocky Mountains, although stands occasionally survive beyond 200 years (Burns and Honkala 1990; Jones and Schier 1985). Assuming the same holds true for aspen in the Blue Mountains, then most of the aspen overstories are approaching the end of their natural life cycles. While several stands still appear to be vigorous, most are rapidly declining. A genetic survey conducted in the 1990s throughout the Blue Mountains indicated that the genetic diversity of aspen stands is strongly tied to the number of stands. The average number of clones per stand is only 2.5 and half the stands sampled were monoclonal (Swanson et al. 2010).

Desired Condition: The distribution and abundance of aspen across the landscape is consistent with their natural range of variability. Aspen habitats are ecologically resilient, sustainable, and compatible with natural disturbance processes. A diversity of aspen age and structure classes exists among clones and stands in a distribution similar to the ranges displayed in Table 10. Younger encroaching conifer species are minimal or absent within aspen stands.

Scale: The desired conditions for aspen special plant habitats can be applied at a variety of scales identified by species (i.e., national forest, watershed, subwatershed, or fine-scale stand-level).

Table 10. Desired conditions for age and structural composition of aspen

Age (Years)	Structural Class	Percentage of Aspen Forest Area
0-40	Stand Initiation	45–50
40-80	Stem Exclusion and Understory Reinitiation	45–50
80+	Old Forest Multi-Storied and Single-Storied	5–10

Source: Swanson et al. 2010

1.13.3 Sagebrush Steppe

Background: Sagebrush habitats in eastern Oregon are extensive and diverse, ranging from low elevation valleys to high mountain areas and from grassland-like shrub-steppe to relatively dense shrublands. In addition, there are many species of sagebrush. For example, in the Blue Mountains, sagebrush shrubland species vary by elevation and soils but include low sagebrush, silver sagebrush, rigid sagebrush, basin big sagebrush, Wyoming big sagebrush, mountain big sagebrush, threetip sagebrush, bitterbrush, and rabbitbrush. Altered fire regimes, invasive plants (such as invasive annual grasses or juniper), human development, and climate change are the primary stressors to sagebrush.

Sagebrush habitats have been reduced by more than 21 percent in Oregon from the late 1850s (Hagen 2011). Much of the loss has been due to conversion by agriculture and the conversion of lands to other exotic forbs and annual grasses (Wisdom et al. 2000). More than 90 percent of the sagebrush steppe community currently occurs within Bureau of Land Management and private lands, while only 8 percent occurs within National Forest System lands, U.S. Fish and Wildlife Service administered lands, and Oregon Department of State Lands.

Existing Condition: As indicated previously, there are several sagebrush communities in the Blue Mountains, not all of which would be part of the sagebrush steppe special habitat. For example, the mountain big sagebrush/elk sedge plant community is a high elevation community found on gentle to steep mountain slopes above 5,000 feet (Johnson and Clausnitzer 1992).

Sagebrush steppe habitat occurs on less than 1 percent of the Umatilla National Forest.

> **Desired Condition:** Sagebrush steppe habitat exists on National Forest System lands and 70 percent of the existing sagebrush rangelands are in later structural stages (sagebrush classes 3, 4, and 5). The understory is comprised of native species, resulting in conditions that are sustainable and resilient to disturbance (i.e., they can recover to their potential community without intervention after a disturbance).
>
> **Scale:** The identification and protection of sagebrush steppe special habitat is primarily accomplished at project level planning. The sustainability of special plant habitats is best addressed at the forestwide scale using consideration of the best available climate projections.

1.14 Old Forest and Individual Old/Large Trees

Background: The Blue Mountains were historically dominated by and well known for vast expanses of old forest, particularly within the dry upland potential vegetation group. Old forest is a late stage of stand development mainly distinguished from younger forest by having an abundance of trees that are biologically old and large. Old forest has been defined many times and in several different ways. It is difficult to write a definition of old forest that will be applicable to all forest types (Kaufmann et al. 2007). Although simple impressions of old-growth forests as large trees in an undisturbed forest may exist in many people's minds, answering the basic question, "What is old forest?" is complex (Egan 2007). Interim definitions introduced in the 1990s by the Forest Service, Pacific Northwest Region, incorporated minimum ages ranging from 150 to 200 years with minimum tree sizes of 21 to 31 inches diameter for several forest types common to the Blue Mountains. Because the typical life span, growth rates, and biological size limits of individual tree species vary greatly, the age at which old forest characteristics develop within the Blue Mountains region also varies. It is also important to note that much of old forest is characterized by low and mixed severity fire regimes. Old forest structures that develop under these conditions have evolved more in response to frequent disturbance than in response to

successional processes and the absence of disturbance. Old forest types in the Blue Mountains will look and function very differently than the old forest of the Pacific Northwest’s moist coastal model (Kaufmann et al. 2007; Stine et al. 2014).

A wide spectrum of social and ecological values are associated with old forests as well as individual large old trees. Old forests are some of the most ecologically and socially valuable successional stages in the Pacific Northwest (Spies and Duncan 2009). Old forests of the Blue Mountains are expected to provide a myriad of ecosystem services. Various groups find old forests aesthetically pleasing, ecologically important, economically valuable as a sustainable timber resource, and necessary for a landscape that is healthy and resilient to natural disturbances. Old forests and large old trees are also an important component of cultural identity for many groups of people. Many wildlife species require structural complexity typical of mature and old forests and the presence of large old trees within a stand can make a big difference for wildlife habitat values in both old and young forests (Stine et al. 2014). Widely distributed large, old trees provide a critical backbone particularly to dry and moist upland forests (Hessburg et al. 2015). Old trees, especially large old trees, found both within old forest stands and as scattered individuals are acknowledged to have great importance as ecological keystones. These trees are distinct from their younger versions in terms of ecological function. They have often developed physiological and structural features, which make them extremely valuable in terms of wildlife habitat, fire and drought resistance, and genetic resources (Franklin and Johnson 2012). Other perspectives include viewing the potential economic value of harvesting older and larger trees to foster much needed restoration work. Larger and older trees and forests may also, in some cases, be more susceptible to certain insects or diseases.

Additionally, a subset of old trees called “legacy” trees by Mazurek and Zielinski (2004) are old trees that have been spared during past harvest or have survived stand-replacing natural disturbances and are thus significantly older than those considered average trees in a general area. These “biological legacies” (Franklin 1990; Franklin et al. 2000) are of value to wildlife when they contain unique features such as large, rough-boles with dead horizontal limbs; witch’s broom deformities; are hollow, have heart rot, pockets of decay, or dead and broken tops, cavities or substantial wounds that will allow for burrowing into by wildlife. Species attracted to and dependent on such structural features include bats, owls, woodpeckers, migratory songbirds, and small mammals (Bull et al. 1997).

Much of the public debate regarding old forest management over the last two decades has been driven by social values such as aesthetic and spiritual qualities as well as ecological and economic concerns. Much of the management direction relevant to old forests and large trees has come from the Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (a.k.a. Eastside Screens) which was incorporated into the previous Forest Plan by an amendment in 1995. The Eastside Screens direction has required the Umatilla National Forest to maintain levels of old forest within the historical range of variability and has also prohibited the harvest of any live trees greater than 21-inch diameter when the amount of old forest in the landscape is below the historical range of variability.

Existing Condition: The decline of larger older trees in the last century is an issue of concern across the globe (Lindemeyer 2014). Within the inland northwest, regional landscape assessments over the past 20 years have documented profound declines in the amount of old forests and large old trees (Hessburg and Agee 2003; Hessburg et al. 2005). As has been described previously in Section 1.6, within many areas of the Blue Mountains, when compared to historical conditions, there has been a net loss of larger and older structural stages and individual trees across the landscape.

On the Umatilla National Forest, old forest single-story stage within the dry upland forest potential vegetation group has been greatly reduced from historical levels. This is the most striking area of departure from natural conditions with the current extent of the dry forest in the old forest single-story structural stage being only 4 percent on the Umatilla, compared to a historical condition that ranged between 40 to 65 percent (Table 11). The total amount of old forest within the moist and cold upland forest potential vegetation groups is less departed from the range of what occurred historically on the landscape, although there have been pronounced shifts from single-storied to multi-storied conditions in many areas.

Table 11. Existing old forest structure stages compared to historical range of variability

Potential Vegetation Group/Old Forest Stage	Historical Range of Variability	Existing Condition
Cold PVG-OFSS	5 to 20%	0%
Cold PVG-OFMS	10 to 25%	30%
Moist PVG-OFSS	10 to 20%	23%
Moist PVG-OFMS	15 to 20%	32%
Dry PVG-OFSS	40 to 65%	4%
Dry PVG-OFMS	1 to 15%	8%

OFMS = Old Forest Multi-Story, OFSS = Old Forest Single-Story, PVG = potential vegetation group

Desired Conditions: Old forest stands typically exhibit an abundance of physiologically old and large trees (for a given species and site condition) that are dominant in the overstory. For each forested potential vegetation group, levels of old forest on the landscape exist within the ranges of historical variability indicated in Table 11. The range of desired conditions reflects the natural variations in the mix of structural stage combinations that would be expected to occur across the landscape over time and allows for flexibility with regards to addressing other desired conditions. Stands representing old forest structural stage are well distributed and occur within most management area allocations, but also shift across the landscape over time as a result of primary disturbances (e.g., fire, insects, and diseases).

An appropriate representation of younger and mid-aged trees exists within old forest stands to foster animal abundance and species diversity as well as mitigate the risk of loss from insect and disease agents and increase potential resilience (Stine et al. 2014; O’Hara and Ramage 2013). Old forests and trees provide a variety of ecosystem services and social values, and old forest conservation is integrated and balanced with other ecological and economic desired conditions to the extent practicable.

Scale: Stand to Forestwide level for individual trees. For the old forest structure stage, minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

1.15 Snags and Down Wood

Background: The specific ecological conditions created by high severity fire events, as well as the general level of snags (standing dead trees) and down wood are all critical elements of healthy, productive, and biologically diverse forests (Bull et al. 1997). Thomas (1979) found that

179 wildlife species use snags and down wood within the Blue Mountains. These species depend on snags and down wood for foraging, denning, roosting, and nesting habitat. Down wood also stores nutrients and moisture and aids in soil development. The general levels of snags and down wood as well as the amount of forest that has recently experienced severe fire can all affect the sustainability of particular animal or plant species. Some species are nearly restricted in their habitat distribution to standing dead forests created by stand replacement fires (Hutto 1995).

Snags are the major source of down wood in both upland and riparian areas. Different amounts, ages, and sizes of snags typically exist throughout the forest landscape as a result of various disturbance agents and competition related mortality. At any given point in time, the quantity and extent of snag habitat conditions will vary, but will be greatest following disturbance events, such as wildfire, wind events, and insect and disease outbreaks. Snags and down wood density tend to be higher in riparian areas.

Conditions that exist in the years immediately following high severity, stand-replacing wildfires are unique because they create distinctive elements of forest structure that provide short-term pulses of high quality habitat for some dependent wildlife species. For example, bird communities in recently burned forests are different in composition from those in other habitat types (Hutto 1995).

Severe fire events occurred naturally throughout history. Many areas of the Umatilla now contain more trees than were present in past centuries, particularly in dry forest types, due to wildfire suppression over the last 100 years. The subsequent high fuel loads that remain in some areas could result in stand replacing, high severity fires that occur on a more frequent basis than they did historically (Hessburg et al. 2015). It is for these reasons that desired conditions for post-high-severity fire habitat was developed to describe the level of post-fire habitat that is ecologically appropriate based on an analysis of the historical range of variability. Due to the special conditions that exist after a high-severity fire, these post-fire desired conditions, are presented in addition to the general desired levels of snags within the forest.

Existing Condition: Analysis conducted as part of the Interior Columbia Basin Ecosystem Management Project revealed the following trends regarding the historical distribution of snags across the broad area analyzed by that project (Quigley and Arbelbide 1997):

- Small snags have increased on Forest Service and Bureau of Land Management administered lands (7 percent).
- Small snags have decreased across the basin (14 percent).
- Large snags have decreased on Forest Service and Bureau of Land Management administered lands (8 percent).
- Large snags have decreased across the basin (31 percent).

Most of the increase in small snags occurred within dry forests. The analysis indicated that within the Blue Mountains Ecological Reporting Unit, small snags decreased in the north and increased in the south. The abundance of small-diameter snags and small-diameter down wood in the dry forest has likely increased because of the reduction in the amount and frequency of low intensity wildfire.

The largest decreases in large snags occurred within dry and moist forests. Large snag declines on National Forest System and Bureau of Land Management administered lands were compounded along roads, where fuelwood harvest occurs. The decline in large snags was particularly noted within the northern portion of the Blue Mountains Ecological Reporting Unit.

Past management activities have reduced snag levels and created a higher percentage of the landscape that contains lower numbers of snags than is desired. Past management practices like fire suppression also reduced the percentage of landscape that experiences high-severity fires that create pulses of large numbers (trees per acre) of snags greater than 20 inches diameter.

Desired Condition: The portion of the potential vegetation groups containing the various levels and sizes of snags and down wood, as well as the appropriate level of forest that has recently experienced high severity fire, exist within all of the ranges indicated in Table 12 through Table 15. Table 12 displays the desired condition for down dead wood across the landscape. The desired condition varies based upon the potential vegetation group, size of the dead down wood, and amount of the dead down wood to be found across the landscape. Table 12 illustrates that the desired condition for the majority of the landscape is to have less than 20 tons of down wood per acre with the majority of coarse woody debris being less than 10 inches in diameter.

Table 12. Desired proportion of the potential vegetation groups containing the indicated ranges of down wood

Potential Vegetation Group (PVG)/Forest	< 10 Tons Per Acre	10-20 Tons Per Acre	20-45 Tons Per Acre	45-65 Tons Per Acre	65-90 Tons Per Acre	90 + Tons Per Acre	Desired Residual Tons Composed of Material Greater than 12 Inches Diameter[1]
Cold upland	0-5%	70-80%	5-20%	2-4%	1-2%	1-2%	40-50%
Moist upland	0-5%	70-80%	5-20%	1-2%	1-2%	1-2%	50-60%
Dry upland	60-80%	5-15%	2-4%	1-2%	1-2%	1-2%	60-80%
Lodgepole pine[2]	0-5%	80-95%	1-10%	1-10%	1-2%	1-2%	10-20%

1. The intent of the 12-inch down wood portion of the desired condition is not that 12 inches exactly is needed, but that retention of the largest potential size class based on the size of the existing overstory trees is emphasized.
2. In the Blue Mountains classification system, lodgepole pine is not recognized as a potential vegetation group. However, the desired characteristics for the lodgepole cover type are different enough from either cold or moist forest that it is necessary to separate it.

Table 13 and Table 14 display the desired proportions of the potential vegetation groups that would contain the indicated ranges of snags per acre.

Table 13. Desired proportion of the potential vegetation groups containing the indicated range of snags per acre that are between 10 inches diameter and 20 inches diameter.[1]

Potential Vegetation Group Within Forest	< 1 Snag	1-2 Snags	2-6 Snags	6-10 Snags	10-14 Snags	14-18 Snags	More Than 18 Snags
Cold upland	15-25%	1-5%	5-10%	10-15%	5-10%	5-10%	30-35%
Moist upland	20-30%	5-10%	15-20%	10-15%	10-15%	5-10%	15-25%
Dry upland	55-65%	10-20%	10-15%	2-4%	2-4%	1-2%	2-4%
Lodgepole pine	25-35%	5-10%	10-15%	5-10%	10-15%	1-5%	20-30%

1. Based on DecAID analysis. Mellen-McLean et al. 2009.

Table 14. Desired proportion of the potential vegetation groups containing the indicated range of snags per acre that are 20 inches diameter or greater[1]

Potential Vegetation Group within Forest	< 1 Snag	1-2 Snags	2-6 Snags	6-10 Snags	10-14 Snags	14-18 Snags	More Than 18 Snags
Cold upland	30-40%	15-25%	30-40%	5-10%	2-4%	Less than or equal to 1%	Less than or equal to 1%
Moist upland	25-35%	15-20%	30-35%	5-10%	2-6%	1-3%	2-4%
Dry upland	70-80%	15-20%	5-10%	1-2%	Less than or equal to 1%	1-2%	Less than or equal to 1%
Lodgepole pine	65-75%	5-10%	10-20%	4-8%	1-3%	1-2%	0%[2]

1. Based on DecAID analysis. Mellen-McClean et al. 2009.

2. Because lodgepole pine rarely exceed 20 inches, it is not likely the lodgepole pine cover type will have more than 18 snags exceeding this diameter.

Table 15 shows the desired proportion of each potential vegetation group containing post-fire habitat created by recent (less than 10 years ago) high severity wildfire. High-severity fire means average vegetation top-kill is estimated to be at least 75 percent.

Table 15. Desired proportion of the potential vegetation groups containing post-fire habitat created by recent (less than 10 years ago) high-severity fire[1]

Potential Vegetation Group	Medium and Large Size Forest (Diameter 10” to 20”)	Old Forest (Diameter > 20”)
Cold upland forest	Not Less Than 2.0%	Not Less Than 0.4%
Moist upland forest	Not Less Than 2.0%	Not Less Than 0.3%
Dry upland forest	Not Less Than 1.3%	Not Less Than 0.6%

1. High severity fire means average vegetation top-kill estimated to be at least 75 percent.

Large expanses of forest area containing less than 1 snag per acre typically exist only in areas decades after disturbance when all snags have fallen and the regenerating stand has not begun to produce snags. A mix of clumps, as well as areas of more widely distributed snags, occur within and among stands. In fire-prone areas, areas of higher amounts of snags and down wood occur mostly on parts of the landscape where fire is less likely to frequently consume dead wood and where it is less likely to produce fuels problems. Areas of flat to moderate slope (or the lower third on slopes), concave or straight topography, and north and east aspects are examples of areas that tend to burn less frequently and/or less severely. At the landscape scale, higher amounts of snags and down wood occur in moister plant associations and at higher elevations.

The specific attributes in areas recently affected by high severity fire, and the general level of snags and down wood provide adequate habitat for the following surrogate species: boreal owl, pileated woodpecker, American marten, white-headed woodpecker, western bluebird, fringed myotis, Lewis’s and black-backed woodpecker, wood duck, bald eagle, and red-naped sapsucker.

Scale: The desired conditions presented within Tables 14 through 16 can be applied at scales such as forest-wide or subbasin, although the distribution of snags and down wood can be very clumpy at a fine scale.

Goal 2: Promote Social Well-being

Social well-being contributes to resilience in national forests by fostering public use patterns and restoration strategies that help support human communities, livelihoods, cultures, and social values. National forests offer goods and services that can contribute to community resilience through various job markets and ecosystem services designed to benefit from forest products, as well as scenic and recreational opportunities for those electing to visit the Umatilla National Forest.

Culturally significant foods, such as but not limited to water, salmon, deer, cous, and huckleberry are perpetually available for the cultural, economic and sovereign benefit of American Indian Tribes and contribute to tribal members' social well-being. These resources are central to tribal identity and cultures and provide continued opportunities to apply traditional ecological and cultural knowledge and best available science to manage these resources and to preserve cultural continuity. Each individual using a national forest for its benefits strengthens ties to the land, traditional cultures, and communities, further characterizing social well-being (Pierce-Colfer and Byron 2001).

Attachments to places in and adjacent to the national forest reflect core values that shape and define social, economic, and ecological sustainability within the Blue Mountains and elsewhere (Endter-Wada et al. 1998). Examples include the values different people place on biodiversity, scenery, species' recovery, economic opportunities, self-reliance, tradition, and ecological integrity (Brown and Reed 2000). These and a suite of other values form the basis for collaborative discussions about national forest management and, ultimately, how it affects social well-being.

A diverse and complex set of values that contributes to one's social well-being can be tied to natural resources-related work, including restoration, ranching, and recreation. This work allows people to live in communities that are adjacent to the national forest. These values may include viewing or hunting wildlife, doing natural resource-related work, knowing that restoration efforts are supporting fish populations, and being part of an environment where human traditions and cultures can be maintained.

2.1 Scenery

Background: Scenic attributes, including identifiable patterns, distinct color, texture, form, and elements, such as aspen stands and rock formations, are derived from specific geological features and functioning ecosystems. These features provide a scenic identity and image that is valued as a backdrop for activities and experiences that create memories and meet expectations of Forest visitors (Bacon 1974 and Ryan 2005). People value the Umatilla National Forest for its natural beauty, undeveloped and undisturbed scenes, and rural western setting when visiting, recreating, or traveling locally. There are opportunities to view historical operations, ditches, and structures (i.e., erected by Civilian Conservation Corp) and observe traditional uses in current times (i.e., ranching facilities and pole fences). Mountainous environments and canyons create dynamic settings that contribute to the scenery of the Umatilla. Strong landscape images often appreciated include the diverse plant communities present in the forefront at different elevations along with a multitude of geological features (i.e., rock outcrops and peaks in the background) being integrated with varying types of water features.

Scenery is inventoried and placed into one of seven scenic classes with Scenic Class 1 being highly valued and distinctive and Scenic Class 7 being non-distinctive and valued the least. Each classification is determined by the combination of scenic attractiveness, viewpoint, viewing distance, and duration along with the frequency or number of viewers (USDA Forest Service 1995b). Determining this range of scenic classes allows managers to understand the social acceptability of any change in scenery. Table 16 shows the distribution of scenic classes as inventoried for the Umatilla National Forest.

Table 16. Percent distribution of scenic classes

Scenic Class	Percent Distribution
1	37
2	37
3	18
4	1
5	7
6	N/A
7	N/A

Scenic integrity and scenic stability are two indicators used to evaluate the condition of scenery resources. Scenic integrity addresses human caused disturbances and development that may detract from desired scenic character. Scenic stability addresses the relative stability of the valued scenic character and its scenic attributes. Further in-depth scenic character descriptions can be found in the Scenery Management System Handbook (USDA Forest Service 1995b).

2.1.1 Scenic Integrity and Scenic Stability

Existing Condition: Risks to scenic stability have been primarily received from management related activities of the past, such as wildfire suppression over the past century and timber harvest practices (i.e., clear cuts) before the 1980s. These activities resulted in conditions such as homogenous, overly dense forests with non-fire resistant species and forests heavily laden with fuels. Harvest activities since the 1980s have been designed to blend with natural settings and subsequent impacts have been less severe.

Scenic stability can be at risk from uncharacteristically large stand-replacing wildfire.

Scenic Integrity Level within the Blue Mountains:

- 10 to 15 percent of the landscape has a low or very low scenic integrity level, where visual disturbances detract from the valued scenic character. (An example is a vegetation harvest unit that appears distinctly geometric and unnatural.)
- 20 percent of the area has a moderate scenic integrity level, where openings in the vegetation are largely out of scale, but the edges are blended or are shaped in a manner that appears somewhat natural.
- 50 percent of the area has a high scenic integrity level.
- 15 percent is very high, where the valued scenic character appears intact with no detracting visual disturbances.

Scenic Stability within the Blue Mountains:

- 45 percent of Scenic Class 1 has moderate scenic stability, meaning that most dominant scenery attributes of the valued landscape are present, but there are conditions that may change the stability of the attributes, such as a large-scale wildfire or disturbance from insects and diseases.
- Less than 5 percent of Scenic Class 1 has high scenic stability, meaning that the dominant scenery attributes are present and are likely to be sustained.

Desired Condition: Scenic Class includes desired conditions specific to the class. Table 17 describes the forestwide desired conditions for scenic integrity and scenic stability.

Table 17. Desired scenic integrity levels and scenic stability levels

Scenic Class	Scenic Integrity Levels	Scenic Stability Levels
1	Very high, high	Very high, high
2	Very high, high, moderate	Very high, high, moderate, low
3	Very high, high, moderate	Very high, high, moderate, low
4	High, moderate, low	Very high, high, moderate, low
5	High, moderate, low	Very high, high, moderate, low
6	High, moderate, low	Very high, high, moderate, low
7	High, moderate, low	Very high, high, moderate, low

Scenic Class 1

Desired Condition: Scenery is highly valued, distinctive, and viewed frequently for a continuous duration. The view is highly intact where human alteration is not noticeable and high to very high scenic integrity is present. All naturally occurring or historically valued dominant attributes of the scenic character are present. The ecological condition maintains a high to very high scenic stability condition.

Scale: Forestwide.

Scenic Classes 2 and 3

Desired Condition: Scenery is valued, typical, and viewed frequently, but not continuously. Views are predominantly intact, with alterations compatible with valued scenic attributes. Human alteration may be present but does not dominate the view-shed and moderate to very high scenic integrity conditions prevails. Most dominant scenery attributes are present and are likely to be sustained. Ecological conditions may pose a threat to the valued scenic attributes where low to very high scenic stability is maintained.

Scale: Forestwide.

Scenic Classes 4, 5, 6, and 7

Desired Condition: Scenery is not distinct in form, line, texture and color, viewing frequency is low, and durations are short. Scenery is usually visually intact and disturbances do not dominate the view. Disturbances blend with the natural terrain. Visible utility corridors are linear features with feathered and undulating edges. Corridor

floors blend into natural contours and have groupings of low growing shrubs and boulders that break up the unnatural appearance of a cleared forest floor.

Energy developments are blended into the natural surroundings and low to high scenic integrity is maintained. The dominant scenery attributes of the valued landscape character are present and likely to be sustained. Low to very high scenic stability is maintained.

Scale: Forestwide.

2.2 Recreation

Background: National forests provide opportunities for a wide variety of outdoor recreation activities and settings. The Forest Service manages three types of recreational settings: developed recreation, dispersed recreation, and backcountry recreation. Different recreation activities can occur in any or all of these settings, depending on the nature of the activity. Most recreation users on the Umatilla National Forest participate in dispersed recreation (individually or in small groups), with a small component of activities created for large, organized groups. This creates a diverse range of visitor needs and expectations that the Forest Service is responsible for managing.

Recreation visitation to the Umatilla includes two distinct demographics: regional and local. Regional recreation trends indicate an increasing average age of national forest visitors, an increasing proportion of multicultural and urban visitors, and a decreasing use by younger generations. These regional visitors are looking for developed recreation facilities that are accessible, allow larger recreational vehicles, accommodate larger group sizes, have a high level of staff presence for security, and provide more urban amenities, such as dump stations, cell phone coverage, and potable water. Many regional visitors generally prefer developed sites with amenities, and some of the developed sites do not meet the level of development generally desired by the urban visitors.

Some regional visitors can arrive by airplane, accessing the national forest's backcountry airstrips. Recreational aviation enthusiasts generally have outdoor skills, require less infrastructure, seek less amenity, and desire more primitive settings.

Local recreationists comprise 80 percent or more of the visitation to the Umatilla National Forest (USDA Forest Service 2014). Local visitors tend to seek more remote and traditional recreation activities that require a high level of outdoor skill. In addition, local visitors frequently use motor vehicles to access the national forest, which increases the demand for trailer parking at trailheads, pull-through campsites at campgrounds, and routes that accommodate off-highway vehicle use.

There currently is a high level of deferred maintenance for recreation facilities. Facilities maintenance issues may create health and safety concerns. To keep recreation facilities safe and operable, the national forest staff develops partnerships or seeks alternative funding beyond appropriated funding. If alternative resources are not acquired, facilities such as campgrounds, trails, trailheads, roads, airstrips, and dispersed sites face closure. Deferred maintenance inhibits the ability to upgrade facilities with newer, more durable materials and designs or to develop them for improved accessibility.

The Umatilla National Forest also fulfills the Forest Service mission by permitting many commercial, volunteer, and organizational partners to operate recreational activities. These partners in turn contribute their unique talents, financial resources, and technical capabilities to provide services; otherwise, visitors may not be able to participate. Some of the permitted activities include outfitter and guide services, ski areas and trams, lodges, and recreation events.

Long-term permits are used to manage structures and facilities while short-term permits authorize events and services.

Existing Condition: Generally, recreation user satisfaction across the Umatilla is good or very good regarding developed day use and overnight sites. Visitor satisfaction regarding dispersed recreation is of a wider range with more recreation visitors expressing an average, good, or very good level of satisfaction with the general forest condition. Wilderness visitors rated their satisfaction as good or very good, with notable dissatisfaction about interpretive displays and signs (USDA Forest Service 2014).

Across the Blue Mountains, the national forests received 730,000 visits as identified by the 2014 National Visitor Use Monitoring survey. The top five activities categories for all three national forests were relaxing, viewing natural features, hiking or walking, viewing wildlife, and hunting. These were activities that recreation visitors participated in, regardless of the primary purpose of the visit (USDA Forest Service 2014).

Hunting was the most popular activity with 29 percent reporting it as their primary activity. Viewing natural features ranked second, with 10 percent of all visitors indicating it was the primary purpose of their visit. Relaxing, hiking or walking, fishing, gathering forest products, and downhill skiing were indicated as primary visit purposes by 5 to 10 percent of visitors (USDA Forest Service 2014).

> **Desired Condition:** Outdoor recreation and relaxation in natural environments enrich the lifestyle, mental, and physical condition of national forest visitors. Recreation user satisfaction is maintained or improved. Valued recreation activities continue to be provided as traditional uses. Providers include the Forest Service, other agencies, and private operators. National forest visitors learn and practice environmental ethics, develop and refine outdoor recreation skills, and take on appropriate challenges and risk while respecting other outdoors users.
>
> **Scale:** Forestwide.

2.2.1 Developed Recreation

Existing Condition: The developed recreation setting is primarily found in areas accessible to motor vehicles and adjacent to primary roads and highways. This recreational experience is generally accommodated by facilities that provide comfort and convenience for the visitor in the outdoor environment. Developed recreation sites in this setting include developed campgrounds; ski areas; snow parks; interpretive trails; designed, developed, large, and popular trailheads; and motor boat launch sites. The facilities generally have more constructed amenities than elsewhere within the national forests, which enhance the visitor's experience. Examples of enhanced amenities include interpretive sites and overlooks along scenic byways, downhill ski areas, and lodges and resorts that are managed by commercial operators. The environmental surroundings are usually scenic in nature, such as scenic ridgetops, river corridors, or lakes. The social setting generally involves frequent contact with other recreation users who expect to share the facilities. The primary activities available within these settings are camping, boating and fishing, snowmobiling, downhill skiing, biking, driving for pleasure, and viewing wildlife and scenery.

Developed recreation settings are typically the most well-known and heavily used sites within the national forests. This type of concentrated use requires ongoing maintenance to meet user expectations. For example, few of the facilities offered currently accommodate the size and length of modern recreation vehicles and most are not yet fully accessible for visitors with disabilities. Some crowding is experienced and expected and the cleanliness of the sites may be impacted for

short periods during peak use. Resource impacts are also more frequent due to heavy use near lakes and streams that can cause impacts to stream banks, riparian vegetation, beaches, fish spawning areas, and overall water quality.

About 4 percent of visitors elect to camp in developed sites as their primary recreation activity, with 10 to 20 percent camping at developed sites while participating in other activities.

> **Desired Condition:** Developed facilities, such as campgrounds, restrooms, picnic areas, trailheads, snow parks, and boating and fishing sites, are well maintained, fully functional, provide for visitor safety, and are accessible to people with disabilities. Potable water and sanitary systems provided at the sites meet required health standards. Areas of highly concentrated use provide a full suite of amenities that provide for people of all ages and for those with varying abilities. The facilities are fully utilized with occupancy rates approaching full capacity during peak use periods and moderate occupancy rates during nonpeak summer and fall periods. Facilities provide some comfort for the user as well as site protection. New construction and reconstruction projects utilize, to the extent practicable, a contemporary/rustic design based on the use of native or durable materials (e.g., naturally found materials or materials that appear natural). Facility structures are of consistent design and character. Facilities complement the natural environment by using materials that fit with the surrounding landscape. Impacts to natural resources from visitor use are minimal. Partnerships with private providers are maintained with high-end developed areas, such as ski areas, trams, lodges, and concessionaire-operated campgrounds. Some special use permits, such as recreation residences, provide for recreation opportunities available to permit holders. Scenic integrity is commensurate with the inventoried scenic class.
>
> **Scale:** Recreational setting.

2.2.2 Dispersed Recreation

Existing Condition: Dispersed recreation settings offer a broad array of opportunities to users who require few developed site amenities. National forest camps, rental cabins, and lookouts, off-highway vehicle trailheads, and wayside interpretive sites are examples of minimally developed facilities that are rustic in nature yet appeal to those wanting to be more self-sufficient. The sites lack plumbing, paved surfaces, or potable water sources found in the developed recreation setting. These areas are accessed via secondary or primitive roads and trails. Scenic and recreation river corridors also occur within this setting. Many activities occur here that people associate with a primitive or self-reliant dispersed activity. Peak periods can occur during fall hunting seasons when larger groups tend to congregate for hunting in traditional locations. During the rest of the year, campsites and activities are more dispersed, and social encounters tend to be infrequent.

Visitors seek these settings to participate in a wide variety of activities, such as hiking, hunting, backpacking, stock packing, gathering forest products, biking, off-highway vehicle riding, fishing, and viewing scenery and wildlife. Outfitter and guide services also provide commercial service for hunting, fishing, day rides, and river boating and rafting.

The site amenities and road access in these settings are infrequently maintained, which can result in resource damage due to heavy use of dispersed sites and off-highway vehicle use off roads and trails.

National forest roads and trails comprise between 50 and 70 percent of facilities used by dispersed recreation users on the National Forests throughout the Blue Mountains. Common

facility use includes visitors using scenic byways, picnic areas, snowmobile areas and trails, and frequenting developed fishing sites.

> **Desired Condition:** Dispersed recreation allows national forest visitors opportunities to recreate independent of developed recreation facilities. Encounters with other visitors are common along travel routes; however, activities away from developed facilities provide for fewer encounters.
>
> Recreation activities and access are readily available in this setting. Areas and facilities accommodate a variety of motorized and nonmotorized uses and are primarily used by visitors to begin and end recreational experiences with most of the time spent away from developed facilities. The rustic amenities provided are well maintained and fully functional. Rustic facilities are provided for site protection and sanitary purposes and fit in with the surrounding area.
>
> Partnerships with private providers sustain specialty services, such as big game outfitting and guiding, horseback riding, shuttle services, and bicycle touring. Special use permits provide for recreation opportunities limited to the use holders (i.e., outfitter and guides). Scenic integrity is commensurate with the inventoried scenic class.
>
> **Scale:** Recreational setting.

2.2.3 Backcountry Recreation

Existing Condition: Backcountry recreation includes use of roaded and unroaded backcountry, designated wilderness areas, and wild rivers. While the National Visitor Use Monitoring does not distinguish between backcountry roaded and unroaded visits, there is a distinction for designated wilderness area use. There were 36,000 wilderness area site visits in 2014 to the national forests in the Blue Mountains (USDA Forest Service 2014).

Backcountry recreation occurs in the least developed setting and provides the greatest opportunity for solitude, risk, and challenge in environments of rugged, undeveloped landscapes. These landscapes are often deep, isolated canyons, heavily forested plateaus, subalpine high lake regions, and rocky ridgelines. There are minimal facilities, creating more self-reliance and challenge for visitors. Facilities, which are considered rustic or primitive in nature, such as information or direction signs, rustic toilets, and trails, may be found. In roaded backcountry, secondary roads provide access to small trailheads with only minimal directional signage. Trails for motor vehicle use and trails where motor vehicle use is prohibited are available in some areas but are not always open or maintained. Activities available in these areas, such as hunting and fishing, mountain biking, off-highway vehicle riding, trail riding and stock packing, and river boating and rafting, often require self-reliance and higher levels of outdoor skills.

Although less frequent than at dispersed and developed recreation sites, there are instances of resource damage due to heavy use of popular dispersed campsites, cross-country off-highway vehicle use, frequent use near beaches and high alpine lakes, and heavily traveled destination trails. The degree of solitude can be less than expected in popular areas, as well. Some conflicts between different types of multiple use groups, such as horseback riders, hikers, off-highway vehicle users, backcountry skiers, mountain bikers, and snowmobile users, occur on trails and in multiple use areas.

> **Desired Condition:** Backcountry recreation allows national forest visitors opportunities to recreate independent of developed recreation sites except for trailheads, staging areas, and other developed sites that facilitate backcountry access. Encounters with other people

are infrequent, and motorized uses are uncommon except near main portals. Recreation activities that require minimal amenities are available. The setting presents visitors with opportunities to experience solitude where backcountry skills and abilities are required. Amenities are functional and are provided primarily for site protection, information, vehicle parking, and sanitary purposes. Materials used are rustic and minimal. Partnerships with private providers sustain specialty services, such as backcountry skiing, jet boat and raft trips, aircraft, and big game outfitting and guiding services.

Scale: Recreational setting.

2.3 Hunting and Fishing

Background: Hunting and fishing are traditional recreational, subsistence and treaty uses within the national forests in the Blue Mountains. They are important aspects of local lifestyles and cultures, attract broad regional participation, and provide recreational and economic opportunities to surrounding communities including Tribes, family groups, and individuals to socialize and harvest food for their own use. Hunting was identified by the 2014 National Visitor Use Monitoring as the number one primary activity on the national forests in the Blue Mountains.

Existing Condition: Hunting and fishing remain important to Tribes, national forest visitors, and people who live throughout the region. The activities contribute to and diversify local economies. Activity levels have changed in recent years, with trends now indicating decreasing numbers of hunters and increasing numbers of people fishing on the national forest.

Desired Condition: Opportunities for hunting and fishing are available in a variety of settings. The national forest provides a mix of opportunities that foster hunting, fishing, and visitor activities such that they contribute to local, tribal, and regional economies and lifestyles, and support Oregon and Washington Departments of Fish and Wildlife management objectives wherever feasible.

Scale: Forestwide.

2.3.1 Rocky Mountain Elk

Background: Elk have been identified as a hunted species that is of interest throughout the Plan Area. Both Oregon (ODFW 2003) and Washington (Fowler 2001) have developed management plans for elk in the Blue Mountains. Elk are important economically, ecologically, socially, and culturally within the Plan Area. Bolon (1994) reported that the value of elk hunting within the Blue Mountains of Oregon and Washington ranges between 17 and 20 million dollars per year.

The science around elk and elk habitat use has steadily evolved over the past few decades. In the past, management emphasis was placed on sustaining cover and reducing disturbance during hunting seasons to retain elk on National Forest System lands. Research at that time recommended national forest managers identify explicit canopy cover amounts and road density goals within important elk habitat, such as winter ranges and select summer ranges. Traditionally, open road density (miles of road open to motorized use per square mile) was the metric used to describe human disturbance impacts on wildlife species such as elk. However, a road density metric alone, although important, does not address complexities in patterns of open routes or the frequency of use by motorized vehicles (Rowland et al. 2000 and Rowland et al. 2005).

Effective security for elk includes non-linear areas that are greater than one half mile from open motorized routes and at least 250 acres in size (Hillis et al. 1991). This definition of security stems from the “Hillis Paradigm” that was developed in Montana and focused on reducing bull elk

vulnerability during hunting season. The metric of one half mile from open motorized routes is validated by research from Starkey Experimental Forest and Range in Oregon that identified 0.5 mile as the average minimum distance elk were found away from open motorized routes during hunting seasons (Johnson et al. 2005) and during non-hunting seasons where elk selected areas that were between 0.4 and 0.6 miles away from an open road (Ager et al. 2003). Elk show increased selection of areas away from open motorized routes up to at least 1.25 miles during summer (Rowland et al. 2000). The use of the open motorized route is the cause of disturbance, not the road itself. Although originally designed to inform management of bull elk during hunting season, if applicable, the Hillis Paradigm may be applied more broadly to encompass other seasons of use by elk. Geographical, topographical, or vegetative characteristics, or a combination of these features also enhance the function of elk security.

Hiding cover is typically capable of hiding 90 percent of standing adult elk from the view of a human at a distance equal to or less than 200 feet during all seasons of the year that elk use for bedding, foraging, wallowing, and other functions. Hiding cover may include, but is not limited to trees, shrubs, rocks, or other landscape features that allow animals to conceal themselves partially or fully (Thomas 1979). Because hiding cover is a fine-scale habitat component that is difficult to quantify at the landscape scale, it is not included in our definition of effective elk security. However, hiding cover can help to mitigate the effects of disturbance.

Elk use of forage areas often depends not only on the quality and quantity of forage but also on the proximity of forage to hiding cover and distance to routes open to motorized vehicles, the seasonal use of the route, and the frequency of use (Wisdom et al. 1986, Coe et al. 2011, Ciuti et al. 2012). Lands that provide elk forage typically display less than 40 percent canopy cover and may include grasslands, meadows, and riparian areas where grasses, sedges, forbs, and shrubs grow (Thomas et al. 1988, Cook et al. 2016). Lichen, leaves, and bark from trees provide forage during winter.

Recent research conducted at the Starkey Experimental Forest and Range and other sites provides new insights into the importance of maintaining adequate nutritional resources for elk during summer and minimizing human disturbance effects year round through effective management of motorized and nonmotorized uses and vegetative cover (Rowland et al. 2000, Long et al. 2008, Cook et al. 2016, Proffitt et al. 2016). The value of elk forage and hiding cover for a given season and landscape varies based on the biophysical potential of each landscape to sustain forest cover, topography, and nutritional resources. In addition, elk forage and hiding cover adjacent to open and frequently used roads and trails diminishes the value of these areas to elk depending on the distance from routes open to and used by motorized vehicles (Rowland et al. 2005). For example, on landscapes dominated by flat, open terrain and nutritious forage, elk security is often compromised by motorized disturbance and the forage is used less than it would be with no open motorized routes. Areas with steep topography help ameliorate effects of human disturbance because steep slopes help limit human access and also increase visual obstruction between humans and elk.

Existing Condition: Elk and the management of elk habitat continue to be important within the Plan Area. Habitat abundance and quality in general, and conifer vegetation types, specifically, have not proven to be limiting factors for population expansion. The number of elk hunters remains relatively constant as the elk population in the Blue Mountains has increased since 2010 (ODFW 2015).

Analysis of elk habitat and historical range of variability of vegetation suggests there has been an increase in hiding cover and a potential decrease of quality forage. Forest stand density and

structure correspond to hiding cover and forage requirements for elk. Stand density has increased from historic levels (pre-1900) and large (20 inch diameter and larger) and medium (15 to 20 inches diameter) trees across the landscape have decreased from historic levels. There has been an increase in multi-storied structure mostly in the dry upland forest Potential Vegetation Group but also in some moist and cold upland potential vegetation groups as well. Proximity of forage to elk security (including hiding cover) has been identified as being important to maintain a socially acceptable distribution of elk (Thomas et al. 1988, Wisdom et al. 1986, and Rowland et al. 2005). The distribution of forage and hiding cover (patch size and spacing) varies by potential vegetation group across the Plan Area. The presence of cattle may also be a predictor of elk distribution in some conditions. Studies have demonstrated elk avoidance of cattle during summer (Coe et al. 2001 and Coe et al. 2005).

Typically, elk summer in the higher elevations of the Blue Mountains and, historically, moved to the adjacent valleys during the winter. A large portion of the historic elk winter habitat in the Plan Area is on privately owned land that has been converted to agricultural and rural residential uses. As a result, elk no longer have access to or are unwanted on many of their traditional winter ranges in the Blue Mountains. Damage to fences, crops, and pastures on private land by elk has increased markedly during the past 40 years, leading to the development by Oregon Department of Fish and Wildlife of several elk winter-feeding areas on State, private, and Federal lands to minimize this damage (ODFW 2006b and ODFW 2007).

Motorized use on National Forest System lands, during all seasons, is one of the most consistent variables in determining distributions of elk, and has increased over the past two decades. Wilderness and roadless areas are providing the majority of security for elk on the Umatilla National Forest (Table 18). Sites with high nutritional resources are often selected by elk, but may not be used as often as expected if located near any open routes used by motorized vehicles. In addition, shed antler hunting in late winter and early spring has gained popularity and is a common cause of disturbance to wintering big game animals during a vulnerable time of year when there is limited available forage and inclement weather. As a result, elk may leave their winter range on National Forest System lands earlier, potentially moving onto private agricultural lands, and may experience stress and decreased body condition (ODFW 2015).

During hunting seasons, disturbances to elk from hunting pressure, especially the use of motorized vehicles, have pushed some elk to seek refuge on adjacent private lands where hunting is often not permitted or hunter densities and motorized uses are lower. In addition, private land practices of growing crops that offer high-quality forage to elk have influenced the redistribution of elk from public to private lands during non-traditional times, such as late summer. This situation reduces opportunities for hunter harvest on public lands and has led to damage to crops and pastures on private lands. Table 18 also displays acres and percent of the national forest that currently provides security for elk using a distance band approach (Rowland et al. 2005). The size and shape of lands that provide security for elk are influenced largely by distance from open motorized routes; vegetative cover and topography have mitigating effects.

Table 18. A summary of existing conditions of elk security (areas greater than one half mile from open motorized routes and at least 250 acres in size) for the Umatilla National Forest

Acres of Elk Security	Acres of Elk Security excluding Wilderness	Percent of National Forest	Percent of National Forest excluding Wilderness
606,888	336,632	43%	24%

Analysis was completed at the HUC10 and HUC12 scale using National Hydrologic Dataset (NHD).

Desired Condition: The desired conditions for Watershed Function (Section 1.1), Species Diversity (Section 1.2), Disturbance Processes (Section 1.4), Structural Stages (Section 1.6), Plant Species Composition (Section 1.7), Stand Density (Section 1.8), and Landscape Patterns (Section 1.12) provide sustainable and resilient habitat for elk throughout their seasonal ranges. Elk habitat is spatially and temporally diverse and provides a mosaic of forage, hiding cover, and security across the landscape. The landscape pattern of these attributes provide elk habitat that contributes to improved distribution, abundance, and social acceptability of elk on National Forest System lands.

Hiding cover is available and enhances elk security. Hiding cover and forage patches are distributed to provide adequate biomass and quality forage such that elk remain on National Forest System lands to provide year-round recreational and cultural opportunities and minimize damage to crops and pastures on private lands. Browse and herbaceous plants are available to elk as forage to maintain body condition or animal performance, per the animal's seasonal requirements (e.g. lactation or overwinter survival). The pattern and amount of forage and cover may vary depending on site potential and potential vegetation group desired conditions (1.4, 1.6, 1.8, and 1.12).

Consistent with other desired conditions and management area direction, 30 to 100 percent of a subwatershed provides effective security for elk as defined by Hillis et al. (1991). Lands that provide elk security are distributed across all seasonal ranges providing safety when disturbance in their usual range is intensified by motorized use and other human activities. Larger landscapes that provide elk security exist in appropriate spatial distribution and are connected or are nearby other smaller areas of elk security to allow for seasonal movement of elk across their range and to retain elk on National Forest System lands at all times of the year.

Elk are broadly distributed on spring/summer/fall habitat generally from April through November. Elk habitat provides a balanced juxtaposition of adequate nutritional resources for elk during summer and winter, minimizing human disturbance effects year round, and providing sufficient vegetative cover (Rowland et al. 2000, Long et al. 2008, Toweill and Thomas 2002). Effective elk security (minimal or no motorized use) within flat, high visibility landscapes encourages elk to remain on public lands. In steeper lands with increased topographic relief and/or vegetative cover, effective elk security encourages elk to remain on public lands. Effective security allows elk to utilize available forage and cover during calving season in the spring.

Winter ranges typically exist at lower elevations on smaller portions of the landscape. Elk use winter habitat generally from December through March and often into mid-April. Effective elk security within winter ranges helps maintain body condition and encourages elk to remain on public lands.

Damage to crops and fences on neighboring private lands decrease with improved seasonal distribution of elk on Forest Service lands. Elk populations are distributed across seasonal habitats to fulfil their ecological roles and contribute to societal goals for recreation and available to tribal hunters exercising their tribal hunting rights.

Scale: A variety of spatial extents is applicable in evaluating elk habitat. Scales are described by many of the ecological desired conditions that relate to elk habitat (from Goal 1: Promote Ecological Integrity). Subwatershed and/or ecological ranges (winter or summer) are typical scales to assess habitat effectiveness of forage, hiding cover, security, and distribution of elk. Different scales may be used as appropriate during

project analysis for certain elk habitat attributes (hiding cover or nutrition/forage) or to address areas of particular importance to elk (such as calving or habitat connectivity).

2.4 Cultural Resources

Background: Understanding the role of humans in past and present ecosystems provides a context for understanding landscapes and natural resource issues. Cultural resources have local, regional, and national scientific interest and significance and are elements of worldwide patterns and processes. The Heritage Program ensures that significant archaeological and historical resources are identified, protected, and preserved for the benefit and enjoyment of the public and future generations.

Cultural resource sites are categorized into three broad types: prehistoric site, historic site, or traditional cultural property. A prehistoric site is one that was established before the advent of a continuous written record, or approximately the year 1800. A historic site postdates 1800 and extends to 50 years before present. A traditional cultural property is associated with cultural practices or beliefs of a living community, is rooted in that community's history, and is important in maintaining the continuing cultural identity of the community.

Prehistoric and historic sites and traditional cultural properties that are eligible for listing with the National Register of Historic Places are considered historic properties under the National Historic Preservation Act and are managed and protected under that law. Historic properties may also include historic properties of religious and cultural significance to Indian Tribes. Cultural resource sites for which National Register of Historic Places eligibility has not yet been determined are managed as historic properties until that determination is completed. Significant and/or endangered historic properties are categorized as priority heritage assets and are proactively monitored and managed. Additionally, the National Environmental Policy Act of 1969 requires the Forest Service to consider other types of cultural resources in addition to historic properties such as salmon runs, wildlife herds, or botanical resources.

Existing Condition: More than one-third of all identified cultural resource sites on National Forest System lands within Oregon and Washington are within the national forests of the Blue Mountains.

Prehistoric sites common to the Blue Mountains include quarries, tool manufacturing sites, hunting camps, fishing stations, plant gathering and processing sites, rock art sites, and villages. Historic sites in the area include homesteads, mines, railroads, cabins, corrals, lookouts, and Forest Service administrative sites. Traditional cultural properties and historic properties of religious and cultural significance to Indian Tribes, few of which have been identified, include but are not limited to plant gathering sites, hunting and fishing stations, rock art sites, archaeological sites, and legendary sites.

Cultural resources are threatened by development of infrastructure, inappropriate public use, looting and vandalism, management activities, timber harvest, cattle grazing, and mining, along with natural processes such as erosion by wind and water, weathering, and wildfire. Cultural resource surveys conducted during the planning phase for site-specific projects and prior to ground disturbance can identify previously unknown cultural resources and require changes to the operating plans that mitigate potential damage. Potential effects to cultural resources from project activities are addressed through project-specific mitigation measures during the project planning process. Though the potential to effect cultural resources exists, they have been carefully managed to avoid or mitigate adverse effects.

The Heritage Program ensures that significant archaeological and historic resources are identified and protected. Interpretive, educational, and volunteer projects, such as the Forest Service's Passport in Time program, promote and foster public participation in identifying and understanding cultural resources.

> **Desired Condition:** Significant prehistoric and historic sites, traditional cultural properties, and historic properties of religious and cultural significance to Indian Tribes are identified and protected. Traditional cultural properties are available for appropriate use. Appropriate use and maintenance of historic facilities is encouraged and provides the necessary resources to protect facilities. Knowledge of cultural resources is enhanced by scientific study, and public understanding of cultural history is enhanced through interpretation and education. Traditional cultural properties, cultural landscapes, sacred sites, and other culturally significant areas and resources identified by Tribes and local communities provide tangible links to historically rooted beliefs, customs, and practices.
>
> Significant and endangered historic properties identified by the Forest Service, State Historic Preservation Office, and Tribes are proactively monitored and managed.
>
> **Scale:** Forestwide.

2.5 Roads and Trails Access

Background: Access via roads and trails to and across the national forests has a long history in the Blue Mountains. Trails and migration routes date back to prehistoric times. American Indian migration routes are well documented through the stories of the Confederated Tribes of the Umatilla, Nez Perce, Warm Springs, and others. Many ancient routes are the basis for roads, portions of roads, or trails that are in use today. Trails within the national forests also contributed to 1800s western migration as expeditions passed through the Blue Mountains. One of the most notable routes is the original Oregon Trail.

The history of development for the road system on national forests in the Blue Mountains is primarily related to extractive resource management activities such as mining and logging. Many roads were located directly adjacent to streams and rivers for ease of construction and to provide access for land use activities associated with water such as placer mining, cattle watering, water diversion, and log floating to sawmills. Lode mining necessitated the construction of roads and railroads to haul ores. Logging operations provided the necessary building materials for mining activities and often required additional roads.

Prior to the development of an extensive state highway road system, railroads provided primary access into the Plan Area. Railroad logging can be traced as far back as 1901, and signs of this activity remain today, as evidenced by the numerous railroad grades throughout the area. Some railroad grades were later converted to vehicle roads. Additional roads were constructed to connect communities and for fire management and administrative access to the national forests. Once constructed, roads provided access for other uses, including viewing scenery, camping, hunting, grazing, and gathering forest products, such as berries and firewood.

Many trails within the national forests evolved from game trails, early American Indian hunting trails, and livestock herding trails, or those that were constructed by early recreation users. These trails were constructed to access and connect remote features and destinations, such as remote lakes, hunting and fishing areas, and scenic viewpoints. The majority of national forest trails are in dispersed and backcountry recreation areas.

In the 1990s, widespread adoption of off-highway vehicle use by the public significantly altered forest recreational access. Recreationists began to use off-highway vehicles to access areas that had previously been accessible only by foot or horseback and to access low maintenance level forest roads that had been inaccessible to most conventional vehicles. This expanded type of access resulted in increased resource impacts, conflicts between user groups, safety concerns, and competing public pressure regarding off road travel.

Existing Condition: As logging has decreased since the 1990s on the national forests in the Blue Mountains (Andrews and Kutara 2005), road construction and maintenance associated with timber haul has also decreased. New, permanent road construction has markedly declined, and road system condition has deteriorated. Full maintenance of the transportation system has not been sustainable at the current funding level of the Forest Service. Consequently, the road maintenance budget has been prioritized for double-lane passenger vehicle roads, which are typically the most expensive and most highly traveled portions of the road system. With the focus shifting to maintaining higher-level roads for passenger car use, the deferred maintenance backlog for the remainder of the road system continues to grow. As the condition of the road system has deteriorated, concerns for public safety and resource damage have increased.

Funding for national forest road maintenance comes from annual appropriated funds and from competitive national programs funded by Federal Highway Administration. Funding from the Federal Highway Administration programs is typically used to address expensive road maintenance issues such as asphalt resurfacing or bridge replacement that exceed the normal budget capability of the national forest. These large intermittent investments are necessary to keep higher service level roads serviceable, but are not a substitute for annual operations and maintenance funding.

The allocated annual road maintenance budget for national forests in the Blue Mountains only provides approximately 20 percent of the required annual maintenance funds needed to adequately maintain the current open road system. The annual shortfall adds to an already substantially deferred maintenance backlog. Given the priority of maintaining passenger vehicle access roads, much of the deferred maintenance falls on level 1 (maintenance) and 2 (high clearance vehicles) roads, which represent 93 percent of the road network in the national forests of the Blue Mountains. Many of these roads are decades old with aging infrastructure that may require complete reconstruction to meet established standards, especially when considering they have not had maintenance for years due to the increasing maintenance intervals and growing backlog issues. The continued maintenance of an extensive road system creates many challenges. Roads in disrepair create safety issues and conflicts with protection for natural resources, especially for those such as water quality, aquatic species, and functioning wetland processes. Erosion from roads is known to be one of the largest contributors for degradation to water quality as well as a source of degradation to fish habitat and spawning areas.

A travel analysis report has been completed for the Umatilla National Forest. This report assesses the current national forest transportation system and identifies the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. The report also identifies opportunities for the national forest transportation system to meet current and future management objectives, and provides information that allows integration of ecological, social, and economic concerns into future decisionmaking.

Areas where decommissioned roads and road closures have been implemented in the past have only been moderately successful, with many of the decommissioned and closed roads breached illegally by some public members using trucks to remove rocks, plows to remove berms, or creating paths by driving around the decommissioned road source (such as rocks or berms). The

illegal paths add to soil and vegetation disturbance, degradation, and displacement, with some occurrences resulting in rutting and eventually bare soils.

Off-road access varies across the Umatilla. While having a unique opportunity for hunting, viewing wildlife and scenery, and gathering forest products is valuable to public, it is important to note that motorized cross-country travel has:

- adversely impacted some natural resources,
- contributed to the of spread invasive species across the landscape,
- assisted in the fragmentation of wildlife habitat, and
- changed wildlife and visitor use patterns.

Combining motor vehicle users and nonmotorized users at trailheads and along travel routes, as mentioned above, has and will continue to result in occasional conflicts. The majority of trails and trailheads have numerous maintenance needs due to aging infrastructure. There are limited opportunities for motorized vehicle use on system trails throughout the national forest; however, this type of use is increasing both locally and regionally.

Trails used primarily for foot, pack or riding stock, and mechanized transportation also have occasional conflicts between users. Trails for snowmobiles, Nordic skiers, snowshoes, and dog sleds are on existing National Forest System roads and trails and contribute to winter recreational opportunities on the Umatilla National Forest. Trails, like roads, are maintained each year as funding and personnel are available, and for some locations there are backlogs of maintenance items that are needed.

> **Desired Condition:** Road systems are safe and responsive to public needs and desires, are affordable and effectively managed, have minimal effect on aquatic and terrestrial systems, and are in balance with available funding. Administrative use supports Forest Service management objectives.
>
> Roads needed for the long term are identified and investments are made to minimize negative impacts on the ecosystem. Roads identified for long-term use, but not currently funded for adequate maintenance are put in a stored condition, where they remain on the system but are not actively used. Access requirements anticipated in the future are met by using travel analysis reports to inform travel management decisions.
>
> A system of roads, trails, and areas for nonmotorized and motor vehicle use is identified and is available for public use. Motor vehicle use occurs on roads, trails, and areas open to motor vehicle use in compliance with Travel Management Rule (36 CFR 212). Trails for motor vehicle use provide a variety of recreational experiences, including various difficulty levels and trail lengths, access to scenic areas, and routes through assorted ecosystems while minimizing impacts to natural resources and user conflicts. Loop trails and trailhead developments meet the needs of increased recreation use. Snowmobile use is managed to provide varying challenges and distances while respecting ecological systems and other users.
>
> Opportunities for trails where motor vehicle use is prohibited are emphasized in backcountry nonmotorized, recommended wilderness, and wilderness areas and provide a range of difficulty for a variety of recreational experiences, including mechanized transportation (bicycles – except in wilderness areas), foot travel, and pack or riding stock. Trails are located to provide experiences in different ecosystem types and scenic settings and do not contribute to natural resource damage.

Rights-of-way and easements provide adequate and legal access to National Forest System lands. Cooperative road agreements with States and counties are used to provide a seamless public road system to access private, state, and public lands. Jurisdiction of county, state, and local access roads is appropriate to ensure management objectives are met for both private and state lands.

Where feasible, Forest Service recreation sites are connected to each other and to adjacent communities through pathways, trails, bike lanes, and waterways providing opportunities for both motorized and/or nonmotorized modes of travel and providing for loop-riding opportunities.

The need for tribal access to exercise treaty-reserved rights is acknowledged and supported.

Scale: Forestwide.

2.6 Wildland-urban Interface

Background: The wildland-urban interface areas have been defined and mapped using Geographic Information Systems through a collaborative process that included developing community wildfire protection plans. In the absence of a community wildfire protection plan, the Healthy Forests Restorations Act of 2003 provides a default definition of wildland-urban interface as a 0.5 to 1.5-mile buffer surrounding a community-at-risk, depending on slope, fuels, location of logical fuel breaks, and other factors. Communities may also adjust the boundary to a more logical and defensible location to include critical features, such as municipal watersheds, safety corridors, and infrastructure.

These areas are managed to meet a variety of ecological and human needs, with the main intent being to aid in the protection of communities from wildfire. These lands often display high levels of management activity and associated roads. The landscape area treated within the wildland-urban interface often exceeds 30 percent. The interval between treatments will often be more frequent than is typical for areas outside the wildland-urban interface. These areas are among the highest priority for vegetation treatments (including retreatment for maintenance) and wildfire suppression activities.

Existing Condition: Wildland-urban interface areas have been identified through locally developed community wildfire protection plans that emphasize a collaborative approach to fuel reduction projects on both public and private land and place priority on treatment areas identified by communities themselves. These plans involve identifying fuel hazards, the risk of wildfire occurrence, structures and other community values at risk, and local preparedness capabilities. Community Wildfire Protection Plans help establish community priorities and recommendations, and develop action plans and assessment strategies for communities at risk. Currently, all of the counties located within the national forests of the Blue Mountains have prepared Community Wildfire Protection Plans. The ability to reduce fire hazard across agency boundaries and on private ownership contributes to long-term forest health, mitigation of large fires, reduction of suppression costs, and greater firefighter and public safety. Much of the wildland-urban interface area is identified as moderately to highly departed from the vegetation desired condition, and includes a high incidence of lands categorized as fire regime condition class 2 and 3.

Desired Condition: Vegetation conditions within the wildland-urban interface areas are based on wildfire protection objectives, which may over-ride ecological desired conditions. Vegetative structure would result in fire intensity that allows for safe and effective suppression actions within wildland-urban interface areas. In general, vegetation

density would be more open, with lighter fuel loading, in comparison to areas outside the wildland-urban interface. Fire risk within wildland-urban interface areas would be managed so as not to limit the ability to use fire for resource restoration in areas adjacent to wildland-urban interface areas.

Scale: Forestwide.

2.7 Tribal Rights and Interest

Background: The Forest Service maintains government-to-government relationships with federally recognized American Indian Tribes. Government-to-government relationships are vital for protecting and managing ecological resources to honor, support, and respect cultural, spiritual, and community interests and to integrate these as fully as possible into project design. Through treaties, Tribes have reserved rights for their tribal members both on and off-reservation lands. The Forest Service has certain legal responsibilities to American Indian Tribes beyond those identified in treaties that are clarified in statutes, executive orders, and case law that is interpreted for the protection and benefit of federally recognized American Indian Tribes. In meeting these responsibilities, the Forest Service consults with Tribes whenever proposed policies or management actions may affect their interests.

For additional background information, see Federal Trust Responsibilities and Tribal Rights and Interests in Part 2 under Management Focus.

Existing Condition: Government-to-government relationships and communications are a priority in national forest management. National forest staffs understand the significance of an interconnectedness of natural and cultural resources within tribal cultures. Memoranda of Understanding for collaboration, consultation, and cooperation in the management of natural resources on National Forest System lands are in effect between the Forest Service and the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribal Executive Committee, and the Confederated Tribes of the Warm Springs Reservation.

Desired Condition: The Forest Service maintains government-to-government relationships with federally recognized American Indian Tribes. The Forest Service consults with Tribes whenever proposed policies or management actions may affect tribal rights or interests that are protected by treaties, statutes, executive orders, and case law. Consultation serves to protect those rights and interests and to identify and manage areas and resources of tribal importance on national forest lands. National Forest System lands are available for tribal members to exercise their reserved rights. The ability to utilize trust resources contributes to the exercise of tribal rights, interests, and cultures in a manner that promotes ecosystem sustainability.

Scale: Forestwide.

2.8 Culturally Significant Foods

Background: Culturally significant foods (which include generally water, fish, big game, roots and berries) are used in ceremonies and subsistence for the perpetual cultural, economic, and sovereign benefit of American Indian cultures.

A key element of Plateau Indian spirituality is that all animals and plants in the ecosystem, like humankind, are intelligent and have moral rights and obligations. Humans can obtain power from animals or places in this system of faith. In this practice, species can communicate with, transfer power between, and learn from each other. This power extends to the inanimate as

well, such as rocks and natural features (Spier 1930, Hanes and Hansis 1995, Radin 1914). Spiritual life for Columbia River Tribes relies on an environment where all natural components are present; in short, ritual life is inextricably linked to the natural world (Walker 1988).

Approximately 135 species of plants were used as sources of food by the Plateau peoples (Hunn et al.1998). Other plants and plant products are used for a variety of other purposes; for example, over 125 plants were used for dyes, cordage, containers, glues, weaving materials, and medicinal and spiritual purposes (Hunn et al. 1998).

The physical and spiritual healing powers of plants are well recognized by Plateau peoples (Hunn et al. 1998). Medicinal and ritual traditions in plant medicine are linked and are not thought of as separate types of treatment. Plants play important roles in the rituals of Columbia River Tribes. Plant foods are at the center of annual ceremonies that celebrate the return of the foods (and the beginning of harvest) and that are an important part of tamánwit[4] (Conner and Lang 2006, Hunn et al. 1998).

Existing Condition: Forest composition creates varying risks to and opportunities for supporting culturally significant foods. Many federally recognized Tribes are actively engaged with the management and project planning on national forests in the Blue Mountains. These interactions include the expertise brought forward through the wide-ranging tribal natural resource programs aimed at restoring, enhancing, and protecting the natural resources that contribute to the Tribes' cultures and traditions. Tribal resource management programs focus on protecting, preserving, enhancing, and delivering the resources necessary to meet the needs of the Tribe and tribal members for ceremonial and subsistence purposes under treaties or other authorities. Tribal natural resource management staff on reservation lands participate, through consultation with the Forest Service, in the planning, implementation, and decisionmaking of land management activities that affect treaty reserved rights. Tribal natural resource programs include land services, cultural resource management, wildlife resources, forest resources, water resources, range and agriculture resources, and environmental restoration.

The Tribes and the Forest Service have undertaken collaborative restoration and resource protection projects, monitoring programs, and wildlife habitat restoration efforts. Individual project elements include stream and watershed restoration, culvert replacement, streamside and spring protection (exclosures), riparian area planting and large wood recruitment, development and reconstruction of upland water sources for livestock and wildlife, water quality improvement, and wildlife habitat restoration. These combined project and program objectives help support and sustain culturally significant resources that are essential to tribal communities and contribute to the ongoing cultural vitality of the Tribes.

> **Desired Condition:** Culturally significant foods are available and accessible and are sustained by the ecological and cultural processes under which they developed.
>
> **Scale:** Forestwide.

2.9 Community Resilience

Background: Community resilience in this Forest Plan is considered the ability of communities and cultures to adapt to changing ecological, social, and economic conditions. The availability of national forest goods and services has varying impacts on communities within the Plan Area.

[4] Indian law, natural law, or divine law which is the foundation of a physical and spiritual way of life handed down by the Creator at the beginning of time. (Source: Comprehensive Plan, The Confederated Tribes of the Umatilla Indian Reservation, 2010).

Remote communities with less diversified economies tend to be less resilient than communities that are more urban (Horne and Haynes 1999, Quigley and Arbelbide 1997).

Community resilience is the ability of communities and cultures to adapt to changing ecological, social, and economic conditions. The resiliency of local communities and Tribes in the Blue Mountains is important because national forest management benefits from community infrastructure, which includes local knowledge, skilled workers, and social networks and relationships, to provide the foundation for accomplishing work on the national forest. Communities also provide and maintain roads and facilities that are needed for access to the national forests and services for the public, such as food, beverages, and lodging.

National forests are important to the resiliency of local communities and Tribes because residents benefit from jobs and income produced from management activities, such as timber harvesting, livestock grazing, and mining. National forests also provide the context and source for clean water and air, culturally significant foods relating to treaty-reserved rights, wildlife, recreation opportunities, and landscape settings that contribute to residents' quality of life and the character of local communities and Tribes.

Since time immemorial, tribal communities have relied upon forested and grassland habitats for gathering culturally significant resources including water, fish, big game, roots, berries, and other resources for subsistence purposes as well as cultural survival. Forest management activities including timber harvesting, livestock grazing, mining, recreation and other activities in the National Forest may impact these resources that tribal communities rely upon.

Past shifts in land management practices and priorities have had varying effects on local communities and Tribes. In general, isolated communities with less diversified economies have been the least resilient and have had the greatest difficulty retaining the local people whose knowledge and resources can contribute to national forest management and restoration.

Existing Condition: Some communities and Tribes that rely on national forests in the Blue Mountains have suffered from declining economies, which have created changes and challenges. Unemployment rates have risen along with the need for social services. Some of the communities are experiencing population declines, particularly among younger people of working age. For many communities, the lack of people in this demographic has meant a smaller pool of volunteers for the fire department, the school board, and for service organizations. While National Forest System employees have also declined in number, Federal jobs continue to remain relatively stable and represent a significant percentage of employment; Forest Service employees contribute to the community volunteer base. The demographic shift has also influenced declining school enrollment and the ability to maintain medical services in some communities.

Changes in national forest management have also contributed to declining local economies. Similarly, community changes threaten to hamper the ability of the Forest Service to implement projects that contribute to sustainability. In most counties, sawmills have closed either temporarily or permanently. Some skilled workers have remained in the communities, anticipating that market changes or other opportunities to earn a living will emerge.

Additional declines in social and economic conditions in the communities and Tribes will continue to negatively affect national forest management. Although some restoration work can be accomplished by nonlocal contract workers, managing the national forests will require a functional, local infrastructure, with attributes including local knowledge, skilled workers, people who have attachments to the local landscape, and social networks/relationships.

Many of the factors that contribute to community resiliency are beyond the control of communities, counties, States, and the Federal government, including the Forest Service. This limits the ability to improve community resiliency through the management of the national forests.

Desired Condition: Management of the Umatilla National Forest contributes to outputs and opportunities that support community infrastructure. The Umatilla National Forest fosters healthy and resilient communities and American Indian Tribes by providing sustainable ecological services and products, employment and contributions to local organizations. In turn, communities use their infrastructure (which includes manufacturing facilities, local knowledge, skilled workers, and social networks/relationships) to support natural resource management and restoration activities. Local communities and Tribes that rely on the resources of the Umatilla National Forest are resilient and adapt well to changing conditions.

Scale: Forestwide.

Goal 3: Promote Economic Well-being

Economic well-being is a condition that enables people to work, provide income for their families, and support the economies of local communities, American Indian Tribes, the region, and the Nation. The contributions of the Umatilla National Forest toward economic well-being are described for capital and wealth and for the economic production of goods and services.

There are many other values, benefits, and costs not addressed in the following discussion of economic well-being, that are addressed in the section Goal 2: Promote Social Well-being. They include the multitude of benefits and costs not traded in the marketplace and values that are difficult to express in monetary terms or other quantitative measures. These values, benefits, and costs are an important part of social and economic sustainability.

Local economic conditions are interrelated with changes in the economies of Oregon and Washington, as well as with changes in regional, national, and global economies. Recognizing the interdependency between the Forest Service's need for forest management work and the degree to which local industries, infrastructure, employment (including youth), skilled workforce, and other factors provide for this need is important to sustaining and restoring the ecological integrity of the national forests and social and economic conditions of the communities.

Historically, national forests in the Blue Mountains made significant contributions to area communities, both socially and economically. The Umatilla National Forest contributes in vital ways to community resilience by providing jobs and quality of life. It is important to note that the Umatilla is not the sole provider of economic stability for communities in the Plan Area. Recognizing mutual benefits of the relationships between local communities and the national forest is critical to understanding the contributions to the maintenance and enhancement of other desired conditions, such as healthy forests, clean water and air, culturally significant foods, species' recovery, scenery, cultural and historic resources, skilled workforce, and manufacturing infrastructure in the context of other local, regional, and national conditions

3.1 Facilities and Infrastructure

Background: The national forests in the Blue Mountains maintain administrative and recreational facilities for a variety of purposes. Examples of administrative facilities include offices, storage, service and utility buildings, and limited housing. Due to the recreation emphasis of the national forests, there are considerable numbers of recreational and historic facilities. Many

of these are in remote locations. Some are only accessible by horseback, foot, or boat. This section does not address recreation facilities. Refer to Section 2.2 Recreation for more information. The Forest Service uses facility master plans to align changing budgets, administrative, and workforce needs.

Existing Condition: The existing square footage of owned and leased administrative facilities of the Umatilla National Forest exceeds the Forest Service's administrative needs. There are approximately 337,170 square feet of facilities. Of this, 31% is office space, 31% is storage, and housing is 27%. The cost of maintaining these facilities exceeds current budget allocations. The long-term goal identified in the Facility Master Plan is to reduce the amount of facilities space to affordable levels while meeting administrative needs. Current plan is to reduce the facilities footprint by 27,746 square feet. The current master plan outlines which buildings will be disposed of and which will be retained for future use.

Several buildings and sites are eligible for or listed on the National Register of Historic Places. Section 106 of the National Historic Preservation Act of 1966 requires Federal agencies to consider the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. An undertaking such as removal of an eligible or potentially eligible historic building would require compliance with Section 106 of the Act.

> **Desired Condition:** Administrative facilities are safe, efficient, cost-effective, and are maintained at a function and use level that meets management needs. Facilities meet all applicable health, safety, and accessibility standards. Impacts to natural resources are minimal. Administrative facilities complement and harmonize with natural settings. The form of structures is derived by the function and from the landscape setting. For example, structures in mountainous, timbered landscapes have steep rooflines and broad eaves and use durable indigenous materials, such as stone and heavy timbers, with the appearance derived from the local environment. Structures, signage, and other built environment elements reflect the style and character inherent in the local environment (USDA Forest Service 2001). Facility master plans are updated periodically to reflect current needs of the national forest, and acquisition and decommissioning decisions are made based on the approved facility master plans.
>
> **Scale:** Forestwide.

3.2 Land Ownership

Background: The National Forest System lands program emphasizes land acquisitions that protect and enhance identified management resource needs. The program also pursues opportunities to consolidate land ownership, decrease management conflicts, increase management efficiencies, secure and mark property boundaries, and secure rights-of-way to meet administrative and public needs. There is national emphasis on open space preservation, protecting the most ecologically and socially important lands, conserving working lands as sustainable forests and grasslands, and working with communities and private land owners to preserve and maintain existing open space (USDA Forest Service 2007).

Existing Condition: Since 1990, national forests in the Blue Mountains have acquired privately held lands within the national forest boundaries through land exchanges and purchases. The Forest Service has also disposed of lands through land exchanges, small tract sales, and administrative site sales. Within the boundaries of national forests in the Blue Mountains, 94

percent of the land is federally administered. Of the remainder, 5 percent is private land and 1 percent is State or county land.

> **Desired Condition:** Property boundaries are marked to standard. Encroachments, title claims, and trespasses are identified and resolved. Property boundaries are maintained to reduce the likelihood of future encroachments, title claims, and trespass. Road and trail easements are prioritized and obtained to continue access across private lands and reduce rerouting costs.
>
> Landownership adjustment by purchase, exchange, or other authority simplifies and improves management of the national forest. Priorities for land acquisition include non-Federal inholdings within congressionally designated areas, when landowners are willing sellers and the property will enhance the values of the congressionally designated areas, and acquiring lands that support known populations of threatened, endangered, proposed, or sensitive species. Acquisitions, conveyances and land exchanges that resolve fragmented Federal and non-Federal land ownership patterns and benefit the local communities merit high consideration as well.
>
> **Scale:** Forestwide.

3.3 Goods and Services

Background: Historically, national forests in the Blue Mountains contributed to local economies and they continue to do so today. Many people depend on the national forests directly or indirectly for a wide range of goods and services. Some commercial uses include wood for sawmills and fuel, forage for livestock, water for drinking and irrigating downstream crops, recreational opportunities for outfitters and guides, minerals, and energy. Other nontimber products include Christmas trees, firewood, poles, plants, herbs, traditional cultural plants, and mushrooms. Goods and services also include clean water and natural water storage.

There are mutual benefits that flow between cultures, communities, and the national forests that are critical to the maintenance and enhancement of desired conditions. The interdependency between the need for forest management work and the local needs of industries, workforce, and other factors are important to sustaining and restoring the ecological integrity of the national forests and the social and economic conditions of the cultures and communities.

Providing a flow of goods and services from the national forests is important for maintaining an economically viable workforce and supporting an industrial capacity to facilitate forest management needs and contributions to community resiliency. These contributions benefit local, tribal, regional, and national economies.

Existing and desired conditions for 3.3 Goods and Services are described in 3.3.1 Forest Products, 3.3.2 Livestock Grazing, 3.3.3 Special Uses, 3.3.4 Mineral, Energy, and Geological Resources, and 3.3.5 Water Use.

3.3.1 Forest Products

Background: The national forests in the Blue Mountains have a long history of providing timber and other forest products to address local community, regional (for Oregon and Washington), and national needs. During the post-World War II era, communities throughout the Plan Area had a strong economic component related to a wood products industry.

The Umatilla National Forest's annual timber harvest has declined from a high of 74 million board feet in 1997 to an average of approximately 30 million board feet since 2002

(approximately 25 million board feet excluding firewood). Harvest on all other ownerships has also declined by about 30 percent during the same period, for a total decline of about 70 percent in local log supply.

Existing Condition: National economic trends, national forest funding levels, and local market conditions have a considerable effect on the amount of timber sold, and quantities sold may vary considerably by year and by individual forest.

Declines in eastern Oregon federal timber harvest resulted in reductions in east-side volume delivered to Oregon mills over the past 20 years, particularly for ponderosa pine. Unlike other regions in the state, in eastern Oregon there is relatively little private or State forest land to make up for reduced Federal harvests (Gale et al. 2012). During the past 20 years, processing for wood products has also changed. There was a decrease in sawmill production of almost 60 percent. Manufactured board processing decreased by approximately 30 percent, and there was a reduction in plywood and veneer processing of about 10 percent, while pulp processing remained about the same.

The decreasing production capacity, labor saving technological changes, and decreases in logging have resulted in declines for associated employment. More recently, since the bottom of the recession of 2009, the forest sector in Oregon has been slowly recovering. However, certain parts of the Blue Mountains region have been impacted so severely that it is now possible that recovery will be years away. The share of jobs lost during the recession that have since been regained, remains at only one of three or fewer for many affected counties (Kaetzel 2015).

Although some economic diversification has taken place, especially in the retail, health, and business services sectors, economic growth in the Blue Mountains region has been slower than in Oregon, Washington, and the U.S. overall. However, wood products manufacturing remains an important part of local economies. There is expanding use and interest in biomass for fuels.

Timber harvest continues to be an important tool for managing vegetation to achieve desired conditions on the national forests, including those for wildlife habitat, ecological resilience, minimizing impacts by insect and disease susceptibility, and for hazardous fuel management. Without the local forest products industry, the capability of the Forest Service to affordably manage forest vegetation would be significantly reduced.

National forests in the Blue Mountains have also contributed nontimber forest products, such as firewood, mushrooms, and berries to residents and Tribes. For example, in fiscal year 2016, the Umatilla National Forest sold about $43,683 of firewood collection permits and about $4,610 of mushroom collection permits. These products help provide communities with heat and food, and also represent important connections between people and the national forests. Forest products and treaty reserved resources contribute significantly to tribal economies and are not quantified.

> **Desired Condition:** Land classified as suitable for timber production has a regularly scheduled timber harvest program that provides social and economic benefits while contributing toward ecosystem health and sustainability. On land classified as unsuitable for timber production, but available for timber harvest, an irregular timber harvest program is used as a resource management tool to meet nontimber desired conditions such as ecosystem restoration, hazardous fuel reduction or reducing insect and disease risk. Forest products produced from these management activities are utilized to provide economic and social support to local communities.
>
> The supply of timber outputs contributes to a local forest products industry.

Small-diameter biomass provides a variety of forest products, such as hog fuel, fuel chips, pulp, small-diameter round wood, and firewood. Biomass harvesting projects are designed to both improve the resilience and health of forests as well as support opportunities to lead the development of innovative wood building products.

Non-timber forest products, such as berries and mushrooms, continue to be available for gathering in sustainable amounts for public, commercial, and tribal use.

Where compatible with ecological desired conditions, salvage harvest is used to supplement the regularly scheduled timber harvest program and recover the economic value of dead and dying trees following disturbance events.

Scale: Forestwide.

3.3.2 Livestock Grazing

Background: Livestock grazing is a historical use that still resonates with the western culture on the national forests in the Blue Mountains. Grazing has been a part of the landscape since the 1860s when the first miners and homesteaders entered the area. Although livestock grazing on National Forest System lands has decreased since the early 1900s, the ranching industry remains an important part of the local community, culture, and economy. Ranchers are permitted to graze livestock throughout the national forest during late spring, summer, and early fall. Grazing on public land is often an integral component of overall ranch operations.

The national forests in the Blue Mountains, like many areas in the western United States, have a history of intensive livestock use that started in the late 1800s and continued into the mid-1930s. One of the resulting effects is that woody shrubs have become more prevalent on the landscape. Beginning in the late 1970s, improved grazing systems and pasture designs were implemented to facilitate resource recovery. Implementation of the land and resource management plans in the early 1990s reduced the amount of allowable use by livestock grazing to accelerate the rate of land health recovery. In the mid to late 1990s, other mitigations associated with the Endangered Species Act and the PACFISH (USDA and USDI 1995) and INFISH (USDA Forest Service 1995a) amendments to the 1990 Forest Plans were implemented to further protect riparian areas and associated aquatic species.

Modified grazing strategies and implementation of utilization standards have resulted in reduced grazing use levels in riparian areas, resulting in many of the riparian systems showing signs of recovery and riparian vegetation improvement. Investments and maintenance of structural and nonstructural range improvements are contributed to across allotments by both the permittee and the Forest Service. Since the 1990 Forest Plan was implemented, permitted numbers of livestock and/or seasons of use have declined slightly in response to the utilization standards and resolution of resource conflicts.

The annual amount of grazing that occurs within the national forests varies due to resource conditions and livestock markets. The Forest Service adjusts the amount and timing of use based on forage utilization standards. Permittees adjust how much of their authorized use they request based on market conditions.

Existing Condition The average number of cattle permitted to graze on the Umatilla National Forest during the 2011, 2012, and 2013 grazing seasons was about 7,760 animals. This amount of use averaged about 40,000 animal unit months. The average number of sheep during the same period was about 8,150 animals and 8,500 animal unit months.

Grazing use by horses and burros was less than 100 animals. During the 2011-2013 grazing seasons, there were 39 permittees grazing livestock within the Umatilla National Forest. There were 32 active allotments with 810,000 acres of rangeland and grazable forestland associated with those allotments.

Desired Condition: Allotments provide sustainable forage for grazing livestock, while moving toward ecological, social, and economic desired conditions.

Scale: Forestwide.

3.3.3 Special Uses

Background: The Forest Service provides and manages a wide range of recreation and non-recreation special use permits that authorize the occupancy and use of National Forest System lands. Some of the key objectives for the special uses program include managing special uses in a manner that protects natural resource values and public health and safety consistent with the Forest Plans, and facilitating the delivery of recreational opportunities or other land uses.

There is some potential for wind energy development on the national forests in the Blue Mountains. If development of wind energy occurs, it would be managed under special use permit and guided by provisions of Special Uses Handbook FSH 2709.11 Chapter 70, which includes provisions for the protection of wildlife, migratory birds, and raptors. Maps of wind power class provided by the Department of Energy show that wind energy potential sufficient for commercial development exists on National Forest System lands. One known request for placement of a meteorological tower on National Forest System lands has been received in the last 5 years and the future development potential is presently undetermined.

Existing Condition: The Umatilla National Forest manages an average of 230 special use permits annually. This includes permits that are long-term in nature, such as a reservoir or a recreation residence. These types of special use permits may exist for decades. Permits also include short-term uses, such as movie or television filming, and recreation events.

Slightly more than one-half of all special use permits are recreation related with recreation residences being the most common, followed by outfitting and guide permits. The most common non-recreation special use permits authorize utility corridors for powerlines and water transmission, communication towers, and road easements.

Desired Condition: Special uses contribute to ecological, social, and economic desired conditions consistent with law, regulation, and policy.

Scale: Forestwide.

3.3.4 Mineral, Energy, and Geological Resources

Background: National forests provide an essential role in contributing to an adequate and stable supply of mineral and energy resources while continuing to sustain the land's productivity for other uses and its capability to support biodiversity goals. Geological resources in the national forests of the Blue Mountains include leasable energy minerals, such as oil, natural gas, coal, and geothermal resources; saleable minerals, such as sand, gravel, and other rocks used in the construction and landscaping industry; and locatable minerals, such as gold, silver, and other precious and base metals.

Existing Condition: Oil and gas resources are known or suspected to occur in a deep sedimentary basin that underlies the Umatilla National Forest. The extent of these resources is

unknown due to their depth and the difficulty of exploration through the overlying Columbia River basalts. Minor production occurred from the sedimentary basin in the vicinity of Richland, Washington in the late 1950s, but large-scale commercial production has not occurred and no economic discovery has been made in the basin to date.

Coal deposits are known to occur in the Troy and Flora areas and west of Ukiah in the Arbuckle coal field. To date, there has been very little coal development on National Forest System lands in the Plan Area. The coal deposits have been explored in the past with little indication that they are of economic value. There is no active, proposed, or anticipated coal mining or coal bed methane operation on the three national forests in the Blue Mountains.

Geothermal resources exist throughout the Blue Mountains and are revealed in numerous hot springs and warm water wells. This indicates the presence of a widespread, shallow geothermal resource. This resource is not limited to surface manifestations, such as hot springs, but rather appears to occur throughout the area; consequently, estimating the development potential is difficult. Future development potential on National Forest System lands in the Blue Mountains appears to be limited as the distribution of geothermal resources on National Forest System lands is incompletely known and areas of higher potential exist outside the national forests. Presently, the area of highest known potential is Vale geothermal field, near Vale, Oregon.

Saleable common variety mineral resources exist throughout the Blue Mountains. The abundance of volcanic basalt and andesite formations make this resource readily available. Relatively minor production of rock materials (crushed basalt, riprap, crusher reject material) occurs intermittently on the national forests and has an economic value of less than approximately $25,000 annually.

Locatable mineral resources occur on all of the national forests in the Blue Mountains. Historical production has included gold, silver, copper, lead, zinc, platinum, and chromium. At one time, gold mines in northeast Oregon were the largest producers in the state. Gold mineralization appears to be associated with granitic intrusive rocks in the Greenhorn Mountains (Lindgren 1901), thus suggesting the development of hydrothermal mineralization at the time the granites were emplaced. Placer and lode gold deposits were worked extensively from discovery in 1861 through 1942 and some production continues to the present day. In 2016, Bureau of Land Management records show about 1,260 active claims on the three national forests; 1,000 of which are on the Wallowa-Whitman National Forest. Placer mining has occurred in the North, Middle, and Upper Fork John Day, Powder River, Burnt River, and Upper Grande Ronde River. Approximately 1.3 million acres of the national forests, including 910,000 acres in congressionally designated wilderness areas, and the Hells Canyon National Recreation Area, are withdrawn from mineral entry under Federal mining laws.

Desired Condition: Exploration, development, and production of mineral and energy resources contribute to the social and economic needs as well as local communities, and are conducted to minimize adverse environmental effects on national forest surface resources. Reasonable access is provided to valid existing mineral claims, as well as for exploration and production of leasable and locatable mineral resources. Congressionally designated wilderness, wild rivers, municipal watersheds, or other areas of important natural or cultural resource value are withdrawn from mineral entry, subject to valid existing rights.

Scale: Forestwide.

3.3.5 Water Use

Background: The national forests in the Blue Mountains contain the headwaters of the John Day, Umatilla, Walla Walla, Tucannon, Grande Ronde, Imnaha, Powder, Burnt, Malheur, and Silvies Rivers, as well as other streams. The combined area of these river basins totals roughly 19.7 million acres, of which 5.2 million acres are on National Forest System lands. The combined flow of all rivers originating from National Forest System lands is an estimated 7.4 million acre-feet per year, and approximately 5.2 million acre-feet flows directly from within the national forests (Brown et al. 2008 and Gecy 2009). Seventy percent of total streamflow originates on less than 30 percent of the watershed area that comprises the national forests. Groundwater is a major contributor to streamflow, especially in summer. Groundwater spring sources are numerous and occur throughout the Blue Mountains. Water provides habitat for aquatic species, sustains riparian vegetation, which provides habitat for numerous terrestrial wildlife species, and is used for recreation, stock watering, and other uses on national forests in the Blue Mountains. Streams and rivers downstream of the national forests provide water for these same purposes, in addition to domestic, industrial, commercial, and agricultural uses.

Existing Condition: Data for the 1995 water year (Solley et al. 1998) indicate that 97 percent (2.4 million acre-feet; 33 percent of total streamflow) of total water withdrawals from rivers emanating from the Blue Mountains is used for irrigation and about 1 percent is used for human consumption. Seventeen percent of total water withdrawals are from groundwater and the remaining 83 percent is water diverted directly from surface streams. Irrigation water is used primarily from March through October, depending on the basin and state water right laws. In all basins, the availability of additional water for irrigation use is limited and in some basins available water is already fully appropriated.

Within the proclaimed boundaries of the national forests in the Blue Mountains, State-recognized water rights are held for 8,279 points of diversion. Of these 1,360 (16 percent) have groundwater sources and the remainder (84 percent) are surface (stream) water sources. Of 3,913 water rights held by the national forests, 2,898 (74 percent) are used for livestock watering, 607 (16 percent) are for wildlife use, 111 (3 percent) for domestic or public use, and 264 (7 percent) for other forest management uses. State agencies in Oregon and Washington hold more than 2,750 water rights, 99 percent of which are used to protect instream flows.

During the past 30 to 40 years, there has been a trend toward decreased winter precipitation and lower spring stream flows in several river basins in response to gradually warming temperatures in the Pacific Northwest (Halofsky and Peterson 2017). Continuation of this trend, combined with the lack of water in storage facilities, is likely to result in water shortages during years of lower than average winter precipitation.

> **Desired Condition:** Water is available in sufficient quantity and quality, within and downstream of the national forest, to meet human needs (including management actions) as well as the needs of aquatic species considering the range of possible climate change scenarios.
>
> **Scale:** Watershed to subbasin.
>
> See Desired Conditions: Watershed Function (1.1), Hydrologic Function (1.1.1), Riparian Function (1.1.2), Stream Channel Function (1.1.4), Aquatic Habitat Function (1.1.5), and Water Quality (1.11)

Part 2 – Strategy

Introduction

Part Two—Strategy describes how the Forest Service will achieve or maintain forestwide goals, desired conditions, and management area desired conditions. The strategy also includes a description of management areas, special areas, general suitability of areas, plan objectives, and the management focus.

Management Focus

Desired conditions, standards and guidelines, and objectives are used to guide development of projects and activities on the national forests in the Blue Mountains. These Plan components were developed to respond to the need for change and focus on:

- Restoring and Maintaining Terrestrial Vegetation Conditions
- Restoring and Maintaining Watershed Conditions
- Contributing to Social and Economic Stability

These three goals are critical for achieving strong sustainability on the national forests in the Blue Mountains (see Figure 5).

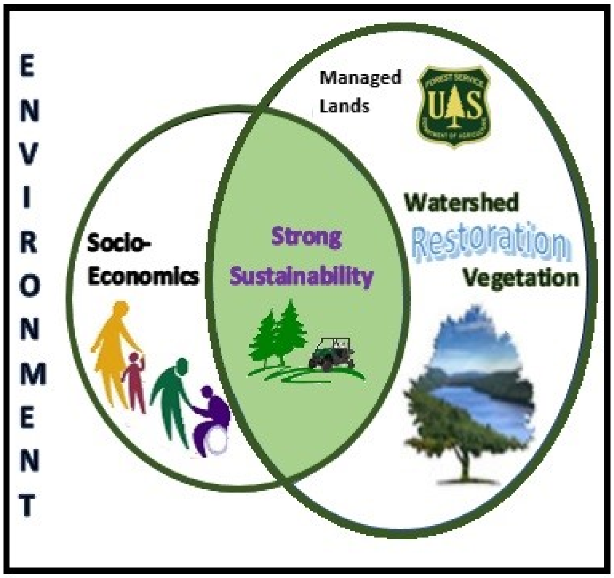


Figure 5. Priorities for the national forests in the Blue Mountains: Strong sustainability through restoration of vegetation and watersheds helps improve socio-economic conditions

Much of the forest and other vegetation on the national forests in the Blue Mountains is highly departed from desired conditions. Dry forest vegetation types have the greatest extent of departed acres and the greatest level of departure. Changes in vegetation conditions have cascading effects on the extent and quality of terrestrial wildlife habitats and watershed conditions. Riparian and aquatic habitats in the Blue Mountains have become fragmented to the extent that local

populations of some aquatic species have become extirpated, while the sustainability of remaining species is at an increasing risk. Many rural communities throughout the Blue Mountains have been affected because of downturns in local economies, associated in part with declines in the delivery of forest products. Many rural communities continue to be heavily dependent on forest products and services.

The overall strategy in the Forest Plan acknowledges the assessment that the restoration needs within the Blue Mountains are substantial and that they currently exceed the capacity of the present workforce and budgets. As such, there is a need to prioritize implementation of projects for the efficient and effective use of available resources. Projects that benefit multiple resource areas generally have a higher priority than those that benefit just one resource. Information contained in the State of Oregon Conservation Strategy, Northwest Power Planning Council subbasin assessments, the Interior Columbia Basin Ecosystem Management Project scientific assessments, Nature Conservancy Portfolio Planning, Community Wildfire Protection Plans and local forest assessments was used in the development of the need for change. The Plan's strong focus on restoring and maintaining watershed, riparian, and aquatic habitat conditions and functions provides a foundation of fulfillment for agency responsibilities under the Endangered Species Act to use agency authorities to promote recovery of federally listed species. This management focus is consistent with recovery plans for federally listed species and their designated critical habitats in the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Restoration will be accomplished by a combination of active and passive management activities. Active management is likely to be concentrated in areas that have established road systems and where previous investments on the land have been made. Undeveloped areas are likely to remain largely undeveloped, with both planned (prescribed) and unplanned (wild) fire used as the tools to improve ecosystem resilience. The full range of management activities associated with wildland fire strategies, from aggressive suppression to point-protection monitoring, will be used so long as the effects are compatible with maintaining or achieving desired conditions. The strategy also recognizes that restoration will not only occur in areas that are the most departed from the desired conditions. By maintaining areas through treatments that are close to or are at the desired condition, management may prevent a departure that could otherwise result in the need for expensive and expansive restoration treatments.

Restoring and Maintaining Terrestrial Vegetation Conditions

The cumulative effects of episodic and sometimes extended weather patterns, increasing vegetation density, shifts in forest species composition, and modified landscape patterns have created vegetation conditions in many locations that are characterized by:

- An increased vulnerability to large and severe fires, insect outbreaks, and disease epidemics;
- Creation of a simplified landscape vegetation pattern dominated by a surplus of dense young and mid-aged forests and a lack of old mature forests;
- A shifting of tree species composition away from species that are naturally the most resistant to disturbance agents like fire, drought, and insect and disease outbreaks; and
- Well-established invasive species that are difficult to eliminate which increases their potential to become more extensive.

These vegetation conditions lead to changes in disturbance regimes, which can put numerous plant and animal species at risk. For some species, the quality and quantity of habitat is below the level necessary for sustainability. Other species may currently have more favorable habitat than

was available historically, but the habitat itself may not be sustainable or other factors may render the habitat less than fully functional.

The management strategy includes creating more resilient and sustainable terrestrial ecosystems that can be maintained by future management in ways that include:

- Implementing invasive plant prevention practices to assist in lowering the introduction, establishment, and spread of invasive plants associated with management actions;
- Modifying uncharacteristic stand conditions to reduce the likelihood of unusually severe disturbances from wildfires, insects, and disease;
- Improving the geographic extent, connectivity, and stand structure of plant and animal habitat;
- Using thinning and planned (prescribed) fire treatments as part of a climate change adaptation strategy;
- Concentrating active restoration activities in areas that are highly departed from desired conditions;
- Using the full suite of active restoration management options to facilitate the creation of a forest mosaic of different ages and structures across the three National Forests; and
- Using wildland fire (planned prescribed fire or unplanned wildfire) alone or in combination with other treatments to accomplish restoration objectives.

Risks are involved with restoring terrestrial conditions. It is expected that throughout the life of the Forest Plan, existing conditions, restoration, and maintenance opportunities will vary within the Plan Area. The approach used will consider appropriate management of short-term risks to achieve long-term benefits.

To create a landscape that is more resilient and better able to respond to episodic or extended fluctuations in climate and other activities that occur on the national forest, managed activities will be designed to move toward desired conditions.

Benefits of moving toward desired conditions include:

- Avoiding the potential loss of genetic diversity, including the elimination of native plant species;
- Decreasing the risk of uncharacteristic wildfire, insect or disease disturbances;
- Improving the sustainability of critical ecosystem services;
- Improving the ability of forest ecosystems to adapt to potential changes in climate; and
- Creating a more resilient forest, which provides for the full range of habitats for native terrestrial plant and animal species, while contributing to a sustainable flow of goods and services from National Forest System lands.

Restoring and Maintaining Watershed Conditions

Under the sustainable multiple-use management concept, this Forest Plan provides for quality

The approach of the Forest Plan includes:

1. Maintaining areas in good condition to keep them from becoming degraded;
2. Allowing for passive recovery where passive recovery provides for progress towards desired conditions;
3. Conducting new and ongoing management activities in a manner that, across broad scales, allows for recovery of those areas that are degraded; and
4. Actively restoring conditions in high-priority watersheds by implementing integrated, strategically focused sets of restoration treatments to facilitate recovery of critical watershed processes.

This strategy is an updated version of the Forest Service's previous aquatic strategy known as PACFISH (USDA and USDI 1995) and INFISH (USDA Forest Service 1995a) consisting of five essential elements: riparian management areas, key watersheds, mid-scale analysis of watersheds, watershed protection or restoration, and monitoring (short-term and long-term). The elements are intended to be used together to achieve a distribution of watershed conditions that are resilient to natural disturbance and that maintain, restore, and enhance habitat for resident and anadromous fish and other aquatic and riparian dependent organisms.

Riparian management areas will emphasize the maintenance, restoration, and enhancement of the ecological health of aquatic and riparian ecosystems, and promote recovery of federally listed species.

Key watersheds are subwatersheds, or groups of subwatersheds, selected to serve as population strongholds for important aquatic species or those that have the potential to do so. They also include subwatersheds that provide high quality water important for maintenance of downstream conditions that support such populations. For purposes of this Plan, key subwatersheds support strong populations of one or more of the following aquatic species: spring Chinook salmon, steelhead, bull trout and redband trout. Key watersheds also include a set of subwatersheds selected by staff that could be restored relatively easily. Key subwatersheds characterized as easily restorable are considered to be priority subwatersheds for focused investments in active restoration over the life of the Forest Plan. Priority subwatersheds targeted for active restoration are listed in Appendix A.

Mid-scale watershed analysis is a procedure used within the Pacific Northwest for evaluating the geomorphic and ecological processes operating within watersheds. It is used to assess the condition and trend of watershed, riparian, and aquatic ecosystems and provide the basis for watershed-scale protection and/or restoration.

Watershed protection and/or restoration is an integrated set of both passive and active actions intended to facilitate the recovery of the physical, biological, and chemical processes that promote the maintenance or recovery of riparian and aquatic ecosystem structure and function and promote recovery of federally listed species.

Monitoring is a strategic assessment of the implementation and effectiveness of management actions and a means of determining whether progress toward achieving desired conditions is being made (or not), and it is used to influence adaptive management decisions.

Adaptive management is a structured, iterative process for decision-making to reduce uncertainty through structured hypothesis testing and monitoring of outcomes. This approach supports decision-making that meets resource management objectives while simultaneously accruing information to improve future management. Key features of adaptive management include:

- Explicitly characterizing uncertainty and assumptions through repeated monitoring and reporting.
- Testing assumptions and collecting data using appropriate temporal and spatial scales.
- Analyzing new information obtained through monitoring and project experience.
- Learning from feedback between monitoring and decisions.
- Adapting assumptions and strategies to design better plans and management direction.
- Making iterative and responsive decisions, evaluating results, and adjusting actions based on what has been learned.
- Creating an open and transparent process that shares learning internally and with the public.

In the Blue Mountains, as elsewhere in the Pacific Northwest, remaining high-quality aquatic habitats are largely located on Federal lands but are often fragmented or disconnected from other high-quality habitats, resulting in reduced ability of aquatic species to access or move between habitats. The quality and types of available habitats no longer encompass the range of habitats that existed historically and in some cases, may not be sufficient to support the full range of affected aquatic species.

Aquatic habitats on National Forest System lands in the Blue Mountains once supported culturally and economically important populations of freshwater species, including anadromous and resident fishes (Chinook salmon, steelhead, redband trout, and bull trout), lamprey and mussels. In most cases, declines in the populations of these species can be traced to habitat degradation (Gregory and Bisson 1997).

It is generally recognized that preservation of existing high-quality habitats and remaining strong populations is critical to the continued survival of anadromous and resident fish populations (Reeves et al. 1995). In addition, restoration efforts should focus on restoring the key ecological functions responsible for the creation and maintenance of aquatic and riparian habitats to make the ecosystems self-sustaining (Beechie and Bolton 1999, Naiman et al. 1992).

In watersheds with federally listed aquatic species or their critical habitat, actions taken to protect or restore the ecological form, function, and processes that achieve the conservation and recovery of federally listed fish and their designated critical habitat are a high priority for both watersheds and socio-economic conditions.

Where management conflicts between desired conditions exist for federally listed aquatic species, consideration should be given to whether short-term disturbance from the activities would promote recovery of the species in the long term. An example is where short-term disturbance makes it necessary to replace an undersized culvert at a road crossing with a new culvert or bridge large enough to provide unimpaired fish passage year-round. To assist with meeting Endangered Species Act, Section 7(a)(1) obligations, management actions (including protection

and active restoration) should be conducted within the range of federally listed species and their designated critical habitat. These actions are needed to remove habitat impairments, correct degraded conditions, and promote an improvement rate such that fully functioning riparian and aquatic habitats (for short and long term) can be developed for the recovery of federally listed species.

The focus of watershed restoration is to complete needed restoration work from ridgetops to valley bottoms to have healthy watersheds. It should be recognized that not all watersheds will be in good condition at the same time and that the condition of some existing high-quality watersheds will eventually be degraded by future disturbance. Replacement habitats will be needed for some populations of aquatic and riparian species (Reeves et al. 1995).

Because of the extent of decline in populations of some aquatic species and the degradation of their habitats, protection of remaining strong populations and their habitats is crucial to their recovery (Sedell et al. 1997). A network of key watersheds is identified to meet this need. Key watersheds have a combination of relative population strength for one of four aquatic species (Chinook salmon, steelhead, inland redband trout, and bull trout), good watershed conditions, and good aquatic and riparian habitat condition (Reiss et al. 2008). Key watersheds are identified at the subwatershed level (USGS and USDA 2012).

Some attributes of key watersheds that make them important for aquatic species may also make key watersheds important habitats for terrestrial wildlife species. Key watersheds may encompass a variety of habitats important to various wildlife species, including source habitats, summer range, winter range, refugia, and migration corridors. In addition, key watersheds are likely to be less affected by past land uses and are therefore more likely to be important to the maintenance of water quality and quantity for a variety of downstream uses, including human uses.

The overall strategy in trying to meet the diverse needs of people for current and future needs is to protect and restore whole watersheds. A desired condition in achieving this strategy is to increase the availability and connectivity of high quality aquatic and riparian habitat. Watersheds in good condition should be preserved through the implementation of mitigation measures that will reduce any potential or existing adverse or negative impacts. Activities within watersheds that have been prioritized for restoration will be designed to reduce impacts using best management practices. Watershed restoration activities will be prioritized so that investments are made in areas that have the highest restoration potential while providing the greatest benefit to multiple resources and the least risk to existing plant, animal, or aquatic populations. These areas are identified as priority watersheds in this Plan. Restoration actions may take place in areas of lower priority as circumstances warrant and as opportunities are presented.

Land managers should identify and seek opportunities to protect or restore processes that promote or foster the goals and objectives in the Forest Plan to support aquatic and riparian habitats.

Key watersheds are located in 17 of the 25 subbasins with streams originating on the three national forests. Seventy key subwatersheds are named as priority watersheds and considered the highest priority for active restoration. These are watersheds where restoration work is currently occurring and where work is expected to begin within the next 10 to 15 years. Appendix A lists the key watersheds for the Umatilla National Forest, including those identified as priorities for active restoration. Maps displaying locations of all the key and priority watersheds are provided in Appendix A.

Restoring and Maintaining Social and Economic Conditions

Ecological conditions and forest management practices are driven by human values and the choices they have fostered (Cronon 1996, Langston 1995, Newell et al. 2005). Since its creation more than a century ago, the Forest Service has been charged with protecting watersheds, timber supply, and other resources, as well as with providing the American public with recreational opportunities and a flow of goods and services. Additionally, the Forest Service has been charged with meeting legal obligations to American Indian Tribes.

A sustainable flow of social amenities depends upon sustainable ecological management practices in watersheds (i.e., restoration of aquatic and terrestrial animal and plant species). Sustainability requires a symbiotic relationship between social, economic, and ecological aspects of ecosystem management (Forman 1995, Wright et al. 2002).

This Plan's management approach is designed to restore and maintain forest ecosystems, scenery, cultural resources, treaty resources, recreation resources, and the wildland-urban interface, as well as contribute to economic opportunities for local communities by:

- Improving the integration of land and resource management with local community and tribal economic development strategies and capabilities;
- Improving the quality, diversity, and sustainability of natural resources on the national forest;
- Considering actions to achieve the goals of greater economic diversity, resilience, and vitality for rural and tribal communities;
- Utilizing local infrastructure to the extent practicable to accomplish ecosystem restoration objectives (e.g. mills, labor, contractors, and schools);
- Maintaining hunting and fishing opportunity through ecosystem management and restoration. The management focus for elk is designed to help distribute and maintain elk on National Forest System lands to provide adequate hunting and viewing opportunities and minimize elk related conflict on private lands by:
    - ♦ Coordinating with State, tribal and other stakeholders to address ecological, social, and cultural issues with elk using best available science;
    - ♦ Implementing an intermediate assessment to prioritize landscapes to maintain or improve elk habitat, in coordination with State, tribal, and other stakeholders, that consider and integrate social tolerance, recreational and hunting opportunity, biophysical conditions, and elk use across scales ecologically meaningful to elk (e.g., subwatershed); and
    - ♦ Maintaining and improving elk habitat by: (1) providing a continuum of elk security across the landscape in strategic locations with a focus on increasing elk security in sub-watersheds with less than 30 percent elk security; (2) moving towards vegetative desired conditions; and (3) strategically creating or maintaining a mosaic of hiding cover and forage patches during project implementation to achieve a landscape pattern consistent with desired conditions.

Federal Trust Responsibilities and Tribal Rights and Interests

American Indian Tribes retain sovereignty over their rights and resources and exercise self-governance with which the Forest Service has established and continues to maintain government-

to-government relationships. The Forest Service has unique legal responsibilities to American Indian tribal governments as set forth in the Constitution of the United States (Article VI, Clause 2), treaties, statutes, Executive Orders, and court decisions. The support for tribal sovereignty and the special government-to-government relationship between the Tribes and the United States is further outlined in Executive Order 13175 (November 9, 2000).

Government-to-government relationships are vital to protecting and managing ecological resources to honor, support, and respect cultural, spiritual, and community interests and to integrate these as fully as possible into project design. Through treaties and other instruments, Tribes have reserved rights for their tribal members both on and off-reservation lands. A significant portion of lands ceded (by virtue of the multiple Treaties of 1855) by the Confederated Tribes of the Umatilla Indian Reservation (12 Stat. 945), Confederated Tribes of the Warm Springs Reservation (12 Stat. 963), Nez Perce Tribe (12 Stat. 957), and Confederated Tribes and Bands of the Yakama Indian Nation of the Yakama Reservation (12 Stat. 951) were established as part of the National Forest System by the Organic Administration Act of June 4, 1897.

While federal laws apply to all federally recognized American Indian Tribes, each Tribe is different and is recognized as a separate and unique government. While some Tribes have treaties, other Tribes were recognized under different authorities and have different rights. Treaty rights and the historical relationships between Tribes and the lands they aboriginally relied upon may differ greatly among Tribes. Cultural differences between Tribes can also be significant. In some cases, several Tribes may each have legitimate interests in the same lands because they each may have occupied or otherwise used those lands during different historical periods. These factors and others combine to make each Forest Service-tribal consultation relationship unique.

Many treaties of the northwest were treaties of cession, whereby Tribes surrendered lands to the United States in exchange for a reservation as well as specific language recognizing that the Tribes reserved rights in their aboriginal territory. It is important to recognize that treaties were not a grant of rights to Tribes, but a grant of rights from the Tribes to the United States. At the time of treaty signing, the land and resources were owned and possessed by the Tribes. Specific rights were enumerated in the treaties as reserved, but other rights that were not ceded to the United States were retained, which is known as the Reserved Rights Doctrine. The Umatilla’s staff understands the significance and interconnectedness of treaty rights and resources within tribal cultures. Tribal members continue to foster longstanding, customary relationships with natural resources on the national forest, continuing an interdependent relationship whereby tribal practices nurture ecological systems, and those systems in-turn nurture and sustain cultural identity and continuity. American Indian access to culturally significant sites is protected under laws that have been specifically enacted to protect tribal rights to: use and possess sacred objects, protect their ancestral graves, archaeological and cultural sites, the freedom of worship through ceremonial and traditional practices, and to collect native plant and animal resources for traditional cultural purposes. Memoranda of Understanding for collaboration, consultation, and cooperation in managing natural resources on National Forest System lands are in effect between the Forest Service and:

- The Confederated Tribes of the Umatilla Indian Reservation
- The Nez Perce Tribe, and
- The Confederated Tribes of the Warm Springs Reservation

The Forest Service consults with Tribes whenever proposed policies or management actions may affect their interests. The Shoshone-Bannock Tribes of the Duck Valley Reservation, Fort McDermitt Paiute and Shoshone Tribes, Fort Bidwell Indian Community of Paiute Indians,

Klamath Tribes, and the Chief Joseph Band of Nez Perce-Colville Confederated Tribes are federally recognized American Indian Tribes that also have interests in the management direction and project planning of the Umatilla National Forest.

Integration of the Management Focus

The integration of terrestrial vegetation, watershed, and socio-economic conditions help to highlight where active improvements are likely to occur.

Considering the factors discussed above, much of the active restoration is likely to occur in:

- Priority watersheds
- Wildland-urban interface
- Dry upland forest potential vegetation groups

Areas where multiple factors overlap have a higher priority than those with only a single factor. Depending on cost sharing or other factors, lower priority work may still occur before higher priority. Prioritization also recognizes the need for maintenance activities to prevent areas from becoming departed and then needing more expensive restoration treatments.

Management Areas

Management areas broadly describe areas where general management intent is similar (see Appendix D). The purpose of management areas is to provide consistent guidance for similar portions of national forest landscapes when implementing or continuing management activities. The management areas generally range along a continuum from little development in MA 1A to extensive human development in MA 5.

All management areas are displayed in Table 19 and full descriptions for each area are presented after the table. Overlap occurs between most management areas. The overlapping results in the total acreage of all management areas being greater than the official national forest acreages. For example, several Research Natural Areas (MA 2B) and wild and scenic rivers (MA 2A) overlap into congressionally designated wilderness areas (MA 1A). In situations where management areas overlap, the more restrictive direction will apply.

Inventoried roadless areas are not assigned to a specific management area. These designated areas overlap with multiple management areas, with most of the overlap occurring in MA 1B, MA 3A, and MA 3B. Other overlap occurs in special areas (MA 2). Regardless of these overlapping management areas, where inventoried roadless areas are present, the prohibitions outlined in the 2001 Roadless Area Conservation Rule apply.

Wilderness area acres have been recalculated using the most current geographic information systems technology. No additions or subtractions to any wilderness areas have been made since the 1990 Forest Plan was signed. Acres of private land inclusions are not included in any wilderness area acre calculations.

Table 19. Management area designation, name, and acreage for the Umatilla National Forest (2F and 2G show miles).

Management Area Designation and Name	Acres
1A – Congressionally Designated Wilderness Areas	304,200
1B – Recommended Wilderness Areas	31,900
2A – Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers)	44,400
2B – Research Natural Areas	11,000
2C – Botanical Areas	900
2D – Geological Areas	400
2E – Historical Areas	1,200
2F – Scenic Byways and All-American Roads	51 miles
2G – Nationally Designated Trails	30 miles
2H – Scenic Areas	31,100
2J – Municipal Watersheds	20,200
3A – Backcountry (nonmotorized use)	49,700
3B – Backcountry (motorized use)	169,200
4A – General Forest	648,000
4B – Riparian Management Areas (300/150/100-foot buffer)	237,500
4B – Riparian Management Areas (within 4A)	119,900
5 – Developed Sites and Administrative Areas	7,500

Note: Figures in the table are rounded to the nearest 100 (acres) unless specifically noted as miles (nearest whole mile).

Special Areas

Special areas within the Umatilla National Forest are managed to protect or enhance unique or special characteristics. They are identified or designated because of their unique or special characteristics. These areas provide for conservation of representative, unique, or rare ecosystems or ecological components, as well as culturally significant components. Some of these areas help provide an important role under an adaptive management philosophy by providing natural reference areas that are managed for special objectives. Management emphasis is primarily focused on protecting or improving, and where appropriate, developing and interpreting the area's special characteristics for public education and enjoyment.

Special areas are formally designated either by congressional statute or by administrative action and are divided into two types of designated areas: congressional and administrative.

Congressionally Designated Areas

Congressionally designated areas are established through a formal act of Congress. These include wilderness areas, wild and scenic rivers, national historic trails, and national recreation areas.

Through legislation, Congress has designated several areas that are unique for their special characteristics and the opportunities they offer. Congressional designation provides specific management direction in these areas.

Administratively Designated Areas

These areas, such as inventoried roadless areas, have been established through administrative procedures by Federal agencies. While administratively designated areas

may be proposed in the Forest Plan, they are established separately and after the planning process is completed. Management direction may include specific direction to preserve the unique characteristics of an area.

The following types of administratively designated areas occur on or across the Blue Mountains: scenic areas; historical, geological, and botanical areas; research natural areas; municipal watersheds; scenic byways; inventoried roadless areas; and nationally designated trails.

As established by the 2001 Roadless Area Conservation Rule, inventoried roadless areas have been designated by regulation, including prohibitions that apply within these designated areas. Inventoried roadless areas overlap multiple management areas with the majority overlapping three management areas: 1A – Recommended Wilderness Area, 3A – Backcountry (nonmotorized use), and 3B – Backcountry (motorized use). Lesser amounts of overlap occur in special areas that contain scenic, historical, geological, botanical, zoological, paleontological, and other special characteristics. The desired conditions, standards, and guidelines for these management area designations align with the regulations outlined in the Roadless Area Conservation Rule.

Management Area Descriptions and Desired Conditions

MA 1A Congressionally Designated Wilderness Areas

Description: As defined by the 1964 Wilderness Act, a wilderness area is undeveloped Federal land retaining its primitive character without permanent improvements or human habitation and is managed to preserve its natural conditions.

Three designated wilderness areas within the Umatilla National Forest were established by legislative acts, including the Oregon Wilderness Act (1984) and the Washington Wilderness Act (1984). These areas are displayed in Table 20. Management plans for individual wilderness areas remain in place, and if management plan components conflict with Forest Plan components, the more restrictive will apply.

Table 20. Designated wilderness areas for the Umatilla National Forest

Wilderness Area Name	Acres[1]
Wenaha-Tucannon	176,753
North Fork John Day	107,158
North Fork Umatilla	20,255
Total	**304,166**

1 The management area acres displayed are taken from the 1990 forest plans and have not been recalculated using the most current geographic information system technology.

Desired Condition: Designated wilderness areas exhibit primitive qualities. Opportunities for research, exploration, solitude, risk, challenge, and primitive recreation are widespread. On the trail system, opportunities for solitude are moderate to high, with few human encounters expected. Opportunities for solitude are high when traveling cross-country with almost no human encounters expected. Campsites may be visible at popular destinations along water features and at major trail junctions. These sites accommodate moderate use. Directional and regulatory signs are primarily found at trailheads outside of this management area but some signs may be present within these

areas along trails and junctions. Buildings are rare within this management area; however, the preservation of historical features or retention of facilities for administrative use may occur. Ecosystems are influenced by natural processes with little or no human intervention. Geological and ecological processes, such as wildfire and insects and diseases, operate relatively free from the influence of humans. Any influences upon these processes by humans is intended to protect human life; protect adjacent private property or private in-holdings; and reduce impacts to federal facilities, historic or cultural structures, and threatened and endangered plant or animal species or species included in the regional forester's sensitive species list. Predominantly diverse, native vegetation results from natural succession and disturbance processes, while nonnative vegetation is rare. The recreation opportunity spectrum is primitive.

MA 1B Preliminary Administratively Recommended Wilderness Areas

Description: The areas in MA 1B have been determined to meet the criteria established to qualify for designation as wilderness areas. These areas are recommended for designation and inclusion in the National Wilderness Preservation System. Regulations at 36 CFR 219.7(a)(2)(v) require units undergoing new plan development or plan revision to "identify and evaluate lands that may be suitable for inclusion in the National Wilderness Preservation System and determine whether to recommend any such lands for wilderness designation." Until Congress acts, these areas will be managed to protect the wilderness characteristics that meet the criteria for designation of these lands as designated wilderness areas. The plan revision process identified four areas on the Umatilla National Forest that meet these criteria (see Table 21).

Table 21. Preliminary administratively recommended wilderness areas for the Umatilla National Forest

Preliminary Administratively Recommended Wilderness Area Name	Acres
Hellhole	21,774
North Fork John Day Wilderness Additions	1,167
North Fork Umatilla Wilderness Area Additions	277
Upper Tucannon	8,654
Total	**31,872**

Desired Condition: Recommended wilderness areas exhibit primitive qualities. Opportunities for research, exploration, solitude, risk, challenge, and primitive recreation are widespread. On the trail system, opportunities for solitude are moderate to high, with few human encounters expected. Opportunities for solitude are high when traveling cross-country with almost no human encounters expected. Ecosystems are influenced by natural processes with little or no human intervention. Geological and ecological processes, such as wildfire and insect and disease disturbances, operate relatively free from the influence of humans. Predominantly diverse, native vegetation results from natural succession and disturbance processes, while nonnative vegetation is rare. Uses are conducive to maintaining the wilderness characteristics of the areas. The recreation opportunity spectrum is primitive.

MA 2A Wild and Scenic Rivers (Includes Designated, Eligible, and Suitable Rivers)

Description: This management area applies to river segments that have been designated as part of the Wild and Scenic Rivers System under the authority of the Wild and Scenic Rivers Act, as amended (1968) and the Oregon Omnibus River Act (1988) (see Table 22). It also applies to rivers identified as eligible or suitable for designation (Table 23). The Act requires that a detailed study report be prepared for all rivers mandated for study under Section 5(a) of the Wild and Scenic Rivers Act, as amended, and for all other rivers identified by the Forest Service as eligible for inclusion in the National Wild and Scenic Rivers System (Sec. 5(d)(1) of the Act). Section 5(d)(1) study rivers found eligible are to be protected pending a suitability determination. Land management agencies must protect section 5(d)(1) study rivers found suitable for inclusion in the National Wild and Scenic Rivers System for their free-flowing condition, water quality, and outstandingly remarkable values. The existence of low dams, diversion works, or other minor structures at the time any river is proposed for inclusion in the National Wild and Scenic Rivers System does not automatically disqualify it for designation, but future construction of such structures is not allowed.

Across the Umatilla National Forest, 3 rivers have been designated by Congress as wild and scenic. Among these rivers, about 60 miles are classified as wild, 13 miles as scenic, and 11 miles as recreational (see Table 22). Management plans for individual designated rivers remain in place, and if management plan components conflict with Forest Plan components, the more restrictive will apply.

> **Desired Condition:** Eligible, suitable, and designated wild and scenic rivers are free flowing, without impoundment, diversion, straightening, rip-rap or other modification of the waterways. Water quality and outstandingly remarkable values are protected and enhanced. Development and access levels are consistent with the classification of the stream or stream segment as designated (or deemed suitable or eligible in the case of river segments that are not designated).

Table 22. Miles of designated wild and scenic rivers[1] on the Umatilla National Forest

River Name	Wild	Scenic	Recreational
Wenaha River	18.7	2.7	0.15
Grande Ronde River[2]	17.4	0.0	1.5
North Fork John Day River[2]	24.3	10.5	8.9
Totals	60.4	13.2	10.55

1. Mileages in this table are derived from legislative language and/or the most recent figures reported in river plans (or “Comprehensive River Management Plans”).
2. The Grande Ronde and North Fork John Day rivers are listed above for both the Umatilla and Wallowa-Whitman National Forests as administration is shared. Mileage for the North Fork John Day River is divided within the table to reflect the mileage within and administered by each national forest. The Grande Ronde River is part of the administrative boundary between the Umatilla and Wallowa-Whitman National Forests, and the mileage is displayed equally for each of the national forests.

Table 23. Miles of eligible wild and scenic rivers on the Umatilla National Forest

River Name	Wild	Scenic	Recreational	Potential Outstandingly Remarkable Values
Bear Creek	4.6	0.0	0.0	Fisheries
Butte-West Fork Creek	13.9	0.0	0.0	Scenery
Desolation Creek	0.0	0.0	21.5	Recreation, botanical
Lookingglass Creek	0.0	7.9	0.0	Hydrological
North Fork Desolation Creek	0.0	0.0	6.8	Botanical
North and South Fork Wenaha River	26.3	0.0	0.0	Scenery, fisheries, botanical
Sheep Creek (in Washington)	0.0	0.0	0.5	Scenery, botanical
South Fork Desolation Creek	0.0	8.9	0.0	Fisheries, botanical
Tucannon River	9.1	4.6	8.7	Recreation, fisheries, cultural, botanical
Totals	57.2	21.4	37.5	-

Wild Rivers

Wild river segments are free flowing and are generally inaccessible except by trail and/or water; the shorelines are essentially natural appearing. Signs of human activity, including structures or evidence of resource use, are minimal. Visitors can interact in a natural environment with minimal sights and sounds of other people. Wild rivers within designated wilderness areas meet the desired condition for MA 1A. The recreation opportunity spectrum is primitive to semi-primitive nonmotorized.

Scenic Rivers

Scenic river segments are free flowing. Shorelines and viewing areas are largely natural appearing but are accessible by roads in some places. Some recreation structures, evidence of timber harvest roads, and other evidence of human activity may be present but do not detract from the near natural appearance and scenic qualities of the immediate environment. A variety of water related recreational opportunities are available. The recreation opportunity spectrum is semi-primitive nonmotorized to semi-primitive motorized.

Recreational Rivers

Recreational river segments are free flowing and are readily accessible from roads. Some major public use facilities, such as developed campgrounds, administrative buildings, bridges, private residences, and commercial businesses, may be within the corridor. Considerable development and silvicultural treatments may have occurred and may be evident near the river. A range of recreational opportunities is available in settings where visitors are likely to share their recreational experience with other individuals or groups. The recreation opportunity spectrum is semi-primitive motorized to roaded natural.

MA 2B Research Natural Areas

Description: Research natural areas form a network of ecological reserves established for research and education purposes and for the maintenance of biodiversity. They are established to conserve unique ecological communities and are intended to promote and protect natural diversity. Research natural areas typify important vegetative, aquatic, and

geological types, as well as other natural situations that have special and unique characteristics of scientific interest and importance.

Research, study, observation, monitoring, and educational activities that are nondestructive and nonmanipulative are generally allowed within research natural areas. While research natural areas are generally not suitable for livestock grazing, some incidental use by livestock could occur within these areas as administrative boundaries are typically not fenced. Forest Plan direction applies, whether the research natural area is established or proposed. The network of established or proposed research natural areas within the Umatilla National Forest are displayed in Table 24.

Desired Condition: Research natural areas and proposed research natural areas exhibit unmodified examples of natural ecosystems with minimal human intervention where ecological processes prevail. Under some circumstances, deliberate manipulation may occur, except in wilderness areas, to maintain or restore the ecosystem or the unique feature for which the research natural area was established or proposed. Recreational uses do not threaten or interfere with the purposes for which the research natural area is established or proposed. The recreation opportunity spectrum depends on the surrounding management areas.

Table 24. Research natural areas for the Umatilla National Forest

Area Name	Acres	Status
Birch Creek Cove	411	Proposed
Kahler Creek Butte (formerly Kelly Creek Butte)	84	Proposed
Mill Creek[1]	7,424	Proposed
Pataha Bunchgrass	67	Established
Rainbow Creek	570	Established
Vinegar Hill	424	Proposed
Wenaha Breaks (formerly Elk Flats-Wenaha Breaks)	1,971	Established
Total	**10,951**	**-**

1. This research natural area is also a designated municipal watershed.

MA 2C Botanical Areas

Description: Botanical areas have special values and unique natural characteristics. Botanical areas contain specimens, groups of plant colonies, or plant communities that are significant because of form, color occurrence, habitat location, life history, ecology, variety, or other features. While botanical areas are generally not suitable for livestock grazing, some incidental use by livestock could occur within these areas as administrative boundaries typically are not fenced.

Table 25 displays acreage of botanical areas in the Umatilla National Forest.

Desired Condition: Botanical areas exhibit the natural composition, structure, and function of each area’s unique ecosystem.

Table 25. Botanical areas in the Umatilla National Forest

Area Name	Acres
Charley Creek	41
Ruckel Junction	9
Karl Urban	499
Shimmiehorn Canyon	197
Henry Creek	34
Farr Meadows	12
Elk Flats Meadow	97
Totals	**889**

MA 2D Geological Areas

Description: Geological areas have outstanding formations or unique geological features of the earth's development, such as caves, fossils, dikes, cliffs, or faults. These areas are protected or enhanced, and where appropriate, public use and enjoyment is fostered. The Umatilla National Forest has one geological area: Big Sink (416 acres)

Desired Condition: Geological areas display unique geological formations and events. Developments provide public enjoyment and interpretation opportunities with high scenic, recreational, and historic value.

MA 2E Historical Areas

Description: These areas are protected or enhanced, and, where appropriate, public use and enjoyment is fostered. These areas are usually small (generally less than 1,000 acres). Historical areas have historic sites, buildings, or objects of significance and may include Historic Properties of Religious and Cultural Significance to Indian Tribes (HPRCSITs). Historical areas may include archaeological sites and districts; existing preservation and management plans developed for these resources inform management actions within these sensitive areas to conserve the values for which these areas are designated. The established historical areas within the Umatilla National Forest are displayed in Table 26.

Desired Condition: Historical areas demonstrate legacies unique to the area. Developments exist to enhance public enjoyment and interpretation if appropriate. Their high historic value is maintained.

Table 26. Historical areas in the Umatilla National Forest

Area Name	Acres
Greenhorn	90
Olive Lake-Fremont Powerhouse	1,000
Target Meadows	83
Total	**1,173**

MA 2F Scenic Byways and All-American Roads

Description: The National Scenic Byways Program is a part of the U.S. Department of Transportation. The program is a grassroots, collaborative effort established to help recognize, preserve, and enhance selected roads throughout the U.S. The U.S. Secretary of Transportation

recognizes certain roads as All-American roads or national scenic byways based on one or more of the following characteristics: archeological, cultural, historic, natural, recreational, or scenic quality.

The purpose of the scenic byways program is to create a distinctive collection of designated roads, their stories, and treasured places by creating a unique travel experience and enhanced local quality of life through efforts to preserve, protect, interpret, and promote the intrinsic qualities of designated byways. Table 27 displays the miles of designated national and state scenic byways within the Umatilla National Forest. Each of the scenic byways has additional mileage beyond the national forest boundaries.

Table 27. Scenic byways within the Umatilla National Forest

Scenic Byway Name	Length (miles)	Designation
Blue Mountain Scenic Byway	48	State
Elkhorn Scenic Byway	3	State
Total	**51**	**-**

Desired Condition: The scenic integrity of scenic byways is high. Scenic byways connect communities with the surrounding natural environment. Corridor management plans provide a frame of reference for meeting scenic integrity objectives and for protecting and enhancing the intrinsic qualities for which byways were designated. Constructed features contribute to the attractiveness of the landscape and/or theme. The recreation opportunity spectrum depends on the surrounding management areas.

MA 2G Nationally Designated Trails

Description: The National Trail System Act (1968) authorized the creation of a national trail system comprised of National Recreation Trails, National Scenic Trails, and National Historic Trails. These trails are included in the listing of specially designated areas because of their scenic, recreational, and historic value. Table 28 displays trails designated within the Umatilla National Forest.

Table 28. Nationally designated trails within the Umatilla National Forest

Trail Name	Length (miles)
Jubilee Lake National Recreation Trail	3.0
North Fork John Day National Recreation Trail	22.9
South Winom Creek National Recreation Trail	4.0
Total	**29.9**

Desired Condition: Nationally designated trails are managed according to the direction in their respective trail management plans. Nationally designated trails meet standards commensurate with the significance of each trail, and the values for which the trails were designated are protected. The trails and associated resources are identified, documented, and interpreted for the public where appropriate. Nationally designated trails are well maintained and are upgraded where necessary to minimize resource damage while providing a safe, consistent surface. Signage is adequate or is improved. Their high scenic, recreational, and historic value is evident. The recreation opportunity spectrum depends on the surrounding management areas.

MA 2H Scenic Areas

Description: Scenic areas are places of natural variety where unique physical characteristics provide pleasing views and dispersed recreational opportunities. Scenic areas are designated to protect or enhance, and, where appropriate, foster public use and enjoyment of areas with special landscapes noted for their natural beauty. There are two designated scenic areas within the Umatilla National Forest (Table 29).

Desired Condition: Scenic areas provide a variety of recreational opportunities for public use and enjoyment while remaining mostly natural in appearance. Although roads provide motor vehicle access to the unique natural beauty and sense of vastness of these areas, the supply and visibility of existing roads is subordinate to the overall scenic character of the landscape. The scenic integrity of these areas is high to very high. The recreation opportunity spectrum may vary from semi-primitive motorized to roaded natural.

Table 29. Scenic areas within the Umatilla National Forest

Name	Acres	Establishment
Vinegar Hill-Indian Rock Scenic Area	21,956	Established in 1966 by Regional Forester and amended in 1978 by adding the Desolation Unit
Grande Ronde Scenic Area	9,158	Established in 1979 by Regional Forester
Total	**31,114**	-

MA 2J Municipal Watersheds

Description: A municipal watershed is an area that serves a public water system as defined by the Safe Drinking Water Act. The Act applies to systems that provide water for human consumption, have at least 15 service connections, or regularly provide water to at least 25 people. The Act was amended in 1996 to require source water protection zones for groundwater wells that provide water for public use. The Act regulates both community and non-community water systems.

The definition of municipal watershed in current Forest Service regulations does not include communities served by a well or confined groundwater unaffected by Forest Service activities. However, the Safe Drinking Water Act of 1974 was amended in 1996 to require source water protection zones for groundwater wells that provide water for municipal use. Designation of municipal watersheds recognizes the need to protect public water supplies. Municipal watersheds may be managed for multiple uses so long as management activities do not degrade water quality.

Management of some municipal water supply watersheds is subject to the terms of existing agreements between the Secretary of Agriculture and the respective cities.

The management of the municipal watersheds is guided by existing agreements between the individual cities and either the Secretary of Agriculture or the Forest Service. Actions that could degrade water quality are either prohibited or are subject to approval by the respective city. For some communities, wells outside the national forest are the primary water source, but wellhead protection zones may extend onto National Forest System lands.

The Mill-Creek Municipal Watershed (20,300 acres) is the only municipal watershed on the Umatilla National Forest that supplies water to the city of Walla Walla, WA.

In addition to the Mill-Creek Municipal Watershed, several communities in Oregon and Washington have watersheds or water sources located on or adjacent to National Forest System lands that should be protected to meet state source-water protection guidelines.

The North Fork Umatilla River was designated as the municipal water supply for the city of Pendleton by the Oregon State Legislature in 1941. In 1984, the area was designated as a wilderness area and the city has since transferred its water intake to a point on the Umatilla River near the city of Pendleton.

> **Desired Condition:** The quality of water used for human consumption meets or exceeds all associated state water quality criteria.

MA 3A Backcountry (Nonmotorized Use)

Description: Backcountry nonmotorized areas are generally areas where recreation opportunities are primitive nonmotorized and semi-primitive, and motorized transportation is not established or suitable. Boundaries are aligned closely with the boundaries of inventoried roadless areas. The prohibitions stated in the 2001 Roadless Area Conservation Rule for timber harvest and road building apply to MA 3A backcountry nonmotorized areas that overlap with inventoried roadless areas. Use is nonmotorized year-round and essentially primitive. Lands in this management area often have high quality or undisturbed soil, water, and air; sources of public drinking water; diversity of plant and animal communities; habitat for species listed under the Endangered Species Act and other species that depend on large, undisturbed areas of land; primitive and semi-primitive nonmotorized dispersed recreation opportunities; natural appearing landscapes with high scenic quality, natural integrity, apparent naturalness, solitude and remoteness; and traditional cultural properties and sacred sites. Backcountry areas that do not overlap with inventoried roadless areas are not subject to the Roadless Area Conservation Rule prohibitions.

> **Desired Condition:** Generally, natural ecological processes predominate. The social setting is one of moderate to high challenge and risk, where people using these areas experience some isolation from the sights and sounds of others. Mechanized uses, such as bicycles, and motorized equipment for trail maintenance, such as chainsaws and generators, are suitable uses. Trail systems are constructed and maintained for use by hikers, equestrians, and cyclists. The scenic integrity of these areas is high. The recreation opportunity spectrum in MA 3A is semi-primitive or primitive nonmotorized.

MA 3B Backcountry (Motorized Use)

Description: Backcountry motorized areas are areas where recreation opportunities are essentially primitive and motorized use is established and suitable. Boundaries are aligned closely with the boundaries of inventoried roadless areas. The prohibitions stated in the 2001 Roadless Area Conservation Rule for timber harvest and road building apply to MA 3B backcountry motorized areas that overlap with inventoried roadless areas. Use in MA 3B Backcountry Motorized Use includes both motor vehicle use and nonmotorized use. These areas are relatively remote but may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designations, or by area restrictions. These areas are characterized by semi-primitive nonmotorized and motorized dispersed recreation opportunities and modified appearing landscapes with moderate scenic quality. Backcountry areas that do not overlap with inventoried roadless areas are not subject to the Roadless Area Conservation Rule prohibitions.

> **Desired Condition:** Generally, natural ecological processes predominate.
> The social setting is one of moderate challenge and risk, where people using these areas experience some isolation from the sights and sounds of others. Motorized and

mechanized uses, such as motorcycles, off-highway vehicles, snowmobiles, bicycles, and motorized equipment such as chainsaws and generators are suitable uses. Trails and primitive developments are constructed and maintained for both motor vehicle and nonmotorized users. The recreation opportunity spectrum in MA 3B is semi-primitive or motorized.

MA 4A General Forest

Description: General forest areas are managed to meet a variety of ecological and human needs. All of the lands identified as suitable for timber production are contained within Management Area 4A. A wide variety of vegetative structure and composition is present, with some showing the effects of past management activities and others showing the effects of predominantly natural forces, such as wildfire, insects, and disease. These lands often display high levels of management activity and associated roads. Visitors expect to see other people and evidence of human activities.

Desired Condition: General forest contributes to the variety of native plant communities and the composition, structure, and patterns defined in the forestwide desired conditions. While the landscape is predominantly natural in appearance, there are some locations where the vegetation composition, structure, density or pattern is altered to meet short- or long-term management objectives that move the landscape towards the forestwide desired conditions. The area is maintained through ecological processes, as well as management activities. This management area contributes important habitat for aquatic, plant and wildlife species that benefit from functional habitat. Additionally, the area supplies a variety of dispersed or developed summer and winter recreational activities.

Recreational use is generally dispersed or located at recreation developments, such as campgrounds with higher use levels. Facilities (whether Forest Service or permitted) are those necessary to provide public or resource benefit, or provide for safety. This area has Forest Service system and other authorized routes. A wide spectrum of travelway types are present, ranging from maintenance Level 1 through 5 roads (closed roads to highways) to trails that serve as recreational features themselves. The recreation opportunity spectrum in MA 4A is roaded natural.

MA 4B Riparian Management Areas

Description: Riparian management areas are areas that include portions of watersheds where aquatic and riparian-dependent resources receive primary emphasis and where special management direction applies. Riparian management areas encompass lands adjacent to permanently flowing streams, ponds, lakes, wetlands, seeps, springs, and intermittent streams, including geologically unstable sites that may influence these lands. Riparian management areas will generally have minimum widths but are designed to extend to the outer edge of riparian vegetation, or to the outer extent of the 100-year floodplain, whichever is greater. Riparian management areas are managed to maintain and restore the riparian structure and function of intermittent and perennial streams, confer benefits to riparian-dependent plant and animal species, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, and provide for greater connectivity within and between watersheds for both riparian and upland species.

However, the desired conditions, standards, and guidelines that apply to MA 4B apply to all riparian management areas (Table 30).

Table 30. Riparian management area widths

Category	Minimum Riparian Management Area Width
Fish-bearing streams	300 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Permanently-flowing non-fish-bearing streams	150 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Constructed ponds, reservoirs and wetlands greater than 1 acre	150 feet slope distance from the outer edge of wetland or from the maximum pool elevation, whichever is greatest
Lakes and natural ponds	300 feet slope distance
Seasonally-flowing, intermittent and ephemeral streams, wetlands smaller than 1 acre, and unstable areas	100 feet slope distance on either side of stream

Riparian vegetation performs numerous key functions for stream ecosystems, including the provision of shade, bank stability, nutrient transfer, retention of organic material, and the supply of woody material.

Because riparian plant species vary in their establishment mechanisms, water requirements, and tolerance to flooding, differences in channel and floodplain morphology result in high spatial and temporal variability in species composition and age class structure within and along riparian zones. This makes riparian areas among the most biologically diverse and productive habitats on the landscape.

Healthy riparian areas are important for the protection of the water quality upon which aquatic species depend and are also used by approximately 75 percent of terrestrial vertebrate species in the Blue Mountains (Raedeke 1989, Thomas 1979). In addition, riparian areas provide critical habitat for numerous sensitive, rare, or uncommon plant and lichen species. Management activities within riparian management areas are designed to maintain, enhance, or restore, as applicable, the ecological processes responsible for the diversity, productivity, and sustainability of riparian habitats.

Management of riparian management areas focuses on the ecological processes and conditions within the riparian management areas and contributes to the value of the aquatic and riparian habitats they contain.

Riparian and wetland areas are the interface between terrestrial and aquatic ecosystems and are an integral part of the watersheds. Consequently, the health of these areas is closely interrelated to the condition of the surrounding watershed (DeBano and Schmidt 1989, Hornbeck and Kochenderfer 2000). The health of riparian corridors is dependent on the storage and movement of sediment through the channel system and on the movement of sediment and water from surrounding hillslopes into the channel system. Human-induced and natural disturbances can alter these processes either indirectly to the watershed or directly to riparian areas themselves by management related activities (i.e., recreation, livestock grazing, road construction, mining, irrigation diversion, channel modification), natural events (i.e., flooding, wildfire), and similar disturbances (Baker et al. 2005, NRC 2002). One good measure of riparian and wetland health is the ecological condition of riparian vegetation relative to reference conditions.

> **Desired Condition:** Riparian management areas within any given watershed reflect a natural composition of native and desired nonnative plant and animal species and a distribution of physical and vegetative conditions appropriate to natural disturbance regimes affecting the area.

Scale: Subwatershed.

Desired Condition: Key riparian processes and conditions (including slope stability and associated vegetative root strength, bank stability, wood delivery to streams; and, within the riparian management areas: input of leafy and other organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistent within natural disturbance regimes.

Scale: Subwatershed.

Desired Condition: Native vegetation is functioning properly throughout the stream corridor or along wetlands and waterbodies. Native mid- to late-seral vegetation appropriate to the site's potential dominates the plant communities and is vigorous, healthy, and diverse in age, structure, cover, and composition on more than 80 percent of the riparian and wetland areas in the watershed. Sufficient reproduction of native species appropriate to the site is occurring to ensure sustainability. Mesic herbaceous plant communities occupy most of their site potential. Vegetation is in a dynamic equilibrium appropriate to the stream or wetland system.

Scale: Subwatershed.

Desired Condition: The species composition and structural diversity of native plant communities in riparian management areas, including wetlands, provides adequate side channels, pools, undercut banks and unembedded substrates. These conditions result in a variety of depths, gradients, velocities, and structure for seasonal thermal regulation, nutrient filtering, appropriate rates of erosion and channel migration, and supplies amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability.

Scale: Watershed scale for forestwide planning; subwatershed scale for project planning.

Desired Condition: Riparian vegetation has the species composition, structural diversity, age class diversity, and extent that is characteristic of the setting in which it occurs and the hydrologic and disturbance regimes in which it developed. The condition and composition of small habitat patches may change over small temporal and spatial scales in response to local disturbances but remains relatively constant at larger scales. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.

Scale: Subwatershed to subbasin.

Desired Condition: Riparian shrub communities occupy their historical range and extent. Individual plants are capable of reaching the full potential for a typical individual of a particular species, as defined by plant height, width, and growth form. Individual plants are able to propagate or reproduce sexually and vegetatively. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.

Scale: Subwatershed.

Desired Condition: Riparian areas consist of native assemblages of riparian-dependent plants and animals free of persistent nonnative species and provide for dispersal and

travel corridors, as well as connectivity, between geographically important areas for both terrestrial and aquatic animals and plant species within the Plan Area.

Scale: Subwatershed.

Desired Condition: The potential for large wood recruitment to streams from within forested riparian areas, and from low-order streams to higher order streams is similar to the potential in reference watersheds with similar forest vegetation types.

Scale: Watershed.

Desired Condition: The wetland/riparian vegetation condition indicator from the 2011 Watershed Condition Framework assessment provides a basis for addressing the impacts to soil and water relative to the vegetative health of rangelands (Watershed Condition Classification Technical Guide FS-278, July 2008). Rangelands reflect native or desired nonnative plant composition and cover at near-natural levels as defined by the site potential. Vegetation contributes to soil condition, nutrient cycling, and hydrologic regimes at near-natural levels. Functional and structural groups, number of species, plant mortality, and decadence closely match that expected for the site. Average annual plant production equals or exceeds 70 percent of production potential. Litter amount is approximately what is expected for the site potential and weather. The reproductive capacity of native or naturalized perennial plants to produce seeds or vegetative tillers is sustainable over the long-term. Introduced plant species are being managed to facilitate long-term replacement by site-adapted native species.

Scale: Subwatershed.

MA 5 Developed Sites and Administrative Areas

Description: Developed sites, administrative areas, and permitted uses such as ski areas, developed campgrounds, recreation residences, administrative and communication sites, and utility corridors are generally limited in extent to meet their designated purpose and occur as a place or feature on the landscape. Ecological values are conserved while protecting the health and safety of humans. Livestock grazing within developed and administrative sites is generally unsuitable, although some administrative sites are used to pasture Forest Service administrative stock. Transportation and motor vehicle access varies. Roads and trails are typically limited and provide access to main site features such as buildings, permit areas, and campsites. Some of these areas are used for administrative purposes such as employee housing, storage, long-term condition and trend studies, and conifer seed orchards. Though small, these areas are important data collection sites that assist with knowledge of ecosystem function and resilience.

Desired Condition Infrastructure design promotes employee, permit holder, and visitor safety and accessibility for all users. Facilities are maintained to standard to provide a safe and suitable work and visitor environment. Grounds, landscaping, and natural vegetation are maintained in a safe condition free of hazards. The appearance is neat, orderly, and complementary to the surrounding landscape setting.

Facilities, structures, and other built elements blend with the natural landscape where possible. The scenic integrity of these areas is commensurate with the inventoried scenic class. Snags and down wood levels are generally less than in other management areas or are absent due to safety concerns. Administrative studies and seed orchards are maintained. The level of development of buildings and ancillary structures, such as water and power systems, support the developed site, permit area, or administrative area.

Vegetation treatments may include consideration of wildfire protection objectives, which may over-ride ecological desired conditions. In these instances, vegetative structure would result in fire intensity that allows for safe and effective suppression actions.

The recreation opportunity spectrum in MA 5 is roaded natural to rural. The following descriptions further explain the desired conditions for specific facility types within the Umatilla National forest.

Communication Sites

Desired Condition: Communication facilities and ancillary features are designed to be consistent with the designated purpose while maintaining human health and safety values and inventoried scenic class. New facilities are designed to minimize impairing scenic, natural, and cultural resource values and to blend with the natural appearing landscape, repeating the form, line, color, and texture of the surrounding valued landscape character. Existing sites and facilities are improved to mitigate affects to on-site values and visual appearance, and to be consistent with the inventoried scenic class. Wherever feasible, communication sites, towers, buildings and other improvements are shared between users to minimize the improvements placed on the national forest.

Utility Corridors

Desired Condition: Utility corridors and ancillary features are designed to be consistent with the designated purpose of providing power and telecommunication services to communities. Human health and safety values are maintained. Proposed new facilities are evaluated for compatibility with existing corridors and scenic, natural, and cultural resource values. Horizontal lines are softened through feathering and scalloping the edges of the corridors commensurate with vegetative and other resource needs. Proposals for new corridors are designed to minimize the visibility of the corridors and repeat the form, line, color and texture of the surrounding valued landscape character.

Developed Recreation Sites and Facilities

Desired Condition: Developed public facilities are operated by Forest Service personnel or permit holders. Sites such as campgrounds, picnic areas, trailheads, snow parks, and boating and interpretive sites are maintained to standards, fully functional, provide for visitor safety, and are accessible to people with disabilities. Grounds, landscaping, and natural vegetation are maintained in a safe condition and free of hazards. Potable water and sanitary systems are limited yet are provided at some sites and meet required health standards. Areas of highly concentrated use provide a full suite of amenities that provide for diversity of users. The facilities are fully utilized with occupancy rates approaching full capacity during peak use periods and moderate occupancy rates during nonpeak summer and fall periods. Facilities provide some comfort for the user as well as site protection. New construction and reconstruction projects utilize a contemporary yet rustic design based on the use of native or durable materials. Impacts to natural resources from concentrated visitor use are minimal. Partnerships with permit holders are encouraged and sustained at high-end public developed areas, such concessionaire-operated campgrounds.

Permitted Recreation Facilities

Desired Condition: Special use permit holders operate private facilities within the terms and conditions of the permit. Public uses are allowed at permitted sites such as lodges, organization camps, and trams. Public use facilities are maintained at a safe and

functional use level and provide for universal accessibility. Grounds, landscaping, and natural vegetation at public use sites are maintained in a safe condition free of hazards. Private users are permitted at facilities such as recreation residences. No new recreation residence tracts or unoccupied lots are permitted. The recreation opportunity spectrum in MA5 is rural. The following descriptions further explain the desired conditions for specific facility types within the national forest.

Ski Areas

Desired Condition: Facilities and structures are designed to blend with the natural environment, using the principles in the Built Environment Image Guide for the National Forests and Grasslands (USDA Forest Service 2001). Facilities are maintained at a safe and functional use level and provide for universal accessibility. Removal of vegetation for ski runs is designed to blend with the natural patterns of the surrounding valued landscape character. Activities are consistent with the approved master development plan.

Administrative Sites

Desired Condition: Administrative facilities include, but are not limited to: guard stations, administrative sites, and administrative pastures. Administrative facilities are safe, efficient, cost-effective, and are maintained at a function and use level that meets management needs and provides for universal accessibility. Facilities meet all applicable health and safety standards and impacts to natural resources are minimal. Grounds, landscaping, and natural vegetation are maintained in a safe condition free of hazards. Administrative facilities complement natural settings. The form of structures is derived by the function and form of the landscape setting. For example, structures in mountainous, timbered landscapes have steep rooflines, broad eaves, and use durable indigenous materials (i.e., stone and heavy timbers) with the appearance derived from the local environment. Structures, signage, and other environmental elements designed reflect the style and character inherent in the local environment (USDA Forest Service 2001).

Suitability of Areas

An area may be identified as suitable for uses that are compatible with desired conditions and objectives. An area may also be identified as not suitable for uses that are not compatible with desired conditions and objectives. Identification of an area as suitable or not suitable for a use is guidance for project and activity decisionmaking and not a commitment nor a final decision approving projects and activities. Uses of specific areas are approved through project and activity decisionmaking.

Management areas are used in this Forest Plan to help further refine suitable uses and guide management. Suitability determinations for management areas are listed in Table 31. Management area designations and names follow.

MA 1A Congressionally Designated Wilderness Areas
MA 1B Preliminary Administratively Recommended Wilderness Areas
MA 2A Wild and Scenic Rivers (includes designated, eligible, and suitable rivers)
MA 2B Research Natural Areas
MA 2C Botanical Areas
MA 2D Geological Areas
MA 2E Historical Areas
MA 2F Scenic Byways and All-American Roads
MA 2G Nationally Designated Trails
MA 2H Scenic Areas
MA 2J Municipal Watersheds
MA 3A Backcountry (nonmotorized use)
MA 3B Backcountry (motorized use)
MA 4A General Forest
MA 4B Riparian Management Areas
MA 5 Developed Sites and Administrative Areas

Table 31. Suitability matrix for management areas

Use or Activity	1A	1B	2A[2]	2B	2C	2D	2E	2F	2G**	2H	2J*	3A	3B	4A	4B	5
Timber production	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	U
Timber harvest[3]	U	U	S	U[4]	S	S	S	S	S	S	S	S	S	S	S	S
Grazing (cattle and sheep)	S	S	S	U	U	S	S	S	S	S	U	S	S	S	S	U
Motor vehicle use (summer)[1]	U	U	U	U	S	S	S	S	U	S	U	U	S	S	S	S
Motor vehicle use (winter)	U	U	U	U	S	S	S	S	S	S	U	U	S	S	S	S
New Road construction	U	U	U	U	U	S	S	S	U	S	U	U	U	S	U	S
New Trail construction (for motor vehicle use)	U	U	U	U	U	S	S	S	U	S	U	U	S	S	U	S
Mechanical fuel treatment	U	U	U	U[4]	U	S	S	S	S	S	S	S	S	S	S	S
Energy development (wind farms, utility corridors, pipelines, etc.)	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	S***

S designates use or activity as suitable. Refer to desired conditions, standards, and guidelines for each management area and/or use for specific guidance.

U designates use or activity as unsuitable. Refer to desired conditions, standards, and guidelines for each management area and/or use for specific guidance.

* All activities in municipal watersheds are dependent on the agreement for management of the watershed between the Forest Service and the municipality.

**Establishing legislation may influence whether motorized use is allowed.

***Energy development is only suitable in designated utility corridors.

1. Indicates suitable applies only to use or activity on roads, trails, and areas open to motor vehicle use that are in compliance with the Travel Management Rule (36 CFR 212).
2. Indicates not suitable for river segments classified as wild rivers, suitable for river segments classified as scenic and recreational rivers.
3. Vegetation in areas suitable for timber harvest shall not be subject to regularly scheduled timber production (regularly schedule timber harvest on suitable lands); since they are not part of our timber suitability landbase.
4. Unless required for restoration of an area to natural conditions (FSM 4063.3.2)

Objectives

Objectives are projections of Forest Service probable activities and program outcomes that are measurable and time specific. Like goals and desired conditions, objectives are not commitments or final decisions approving projects or activities. They are an effort by the Forest Service to demonstrate how progress toward achieving or maintaining the desired conditions during the life of the Plan will be measured. The objectives stated below are only a partial list of the management activities expected to be accomplished, but which will contribute to maintaining or achieving desired conditions (Table 32).

Objectives are based on ecological needs, local infrastructure (e.g. mills, labor, contractors, or schools), and expected funding, including budgets, partnerships, and cooperative agreements. The actual accomplishments will be dependent on actual funding, staffing levels, and local infrastructure. Objectives are not intended to limit or guarantee the amount of work that will be accomplished. More work may be accomplished if additional infrastructure or funding, such as increased budget allocations, partnerships, or other external sources, becomes available. Less work could occur if funding is less than expected, additional infrastructure is not constructed, or existing infrastructure declines or becomes unusable.

The objectives reflect the activities and program outcomes necessary to achieve or maintain desired conditions. Unless otherwise indicated, the objectives are expected to be accomplished during the first decade of the plan period. Many management activities are expected to be designed to address multiple integrated resource objectives at the same time. Therefore, these individually listed objectives are not meant to additively represent the total amount of expected treatment. For example, a single acre of dry forest restoration thinning treatment might simultaneously contribute to an acre of accomplishment toward individual objectives such as: improving hydrologic function by improving forest vegetation conditions; improving the quality of source habitat; moving dry forest toward fire regime condition class 1; decreasing insect or disease susceptibility; and reducing stand density as well as reducing the proportion of undesirable tree species.

Table 32. Objectives (probable activities) for the Umatilla National Forest[1]

Objective	Measure
1.1 Watershed Function[2]	
Increase the number of watersheds in condition class 1 (from condition class 2) and 2 (from condition class 3) through active restoration. Measure: number of subwatersheds (HUC6) with improved condition class.	14 subwatersheds
Improve hydrologic function by: Improving forest vegetative conditions	3,200 acres (annually)
Improving soil hydrologic function in areas of detrimental soil disturbance	750 acres
Reducing road-related sedimentation and reducing hydrologic connectivity of the road system by: considering designating routes for other uses, or closing or decommissioning roads where open motor vehicle routes are negatively affecting riparian conditions.	30-35 miles road surface treated (annually)

Objective	Measure
Improve riparian and wetland function by: Restoring floodplain connections, channel morphology, channel structure, and flow regime (flood flows and low flows) (stream miles)	90 miles (10 years)
Restoring riparian/wetland species composition (riparian acres) by increasing natural seedling establishment, planting, fencing, or modifying riparian management (riparian acres)	165 acres
Increasing effective stream shade by increasing amount and extent of woody riparian species and increasing age-class structure of terrestrial vegetation in MA 4B (stream miles)	225 miles
Improve riparian and wetland function by: Increasing extent and vegetative species diversity of off-channel and isolated wetlands by restoring hydrologic pathways, modifying existing water diversions, or fencing	40 sites
Increasing the number and extent of beaver-created wetlands	10 sites
Improve stream channel and aquatic habitat function by: Improving riparian habitat conditions (riparian acres)	525 acres (annually)
Restoring channel morphology to reflect natural conditions	45 miles
Increasing habitat complexity through channel reconstruction, placement of large wood or other structures, habitat enhancement	90 miles
Increasing aquatic habitat connectivity through culvert replacement	75 culverts, 68 stream miles
1.2 Species Diversity	
In cooperation with state wildlife agencies, expand bull trout occurrence within 10 years into unoccupied suitable stream segments within its natural range.	1 segment
Increase the amount and quality of source habitat (open, old forest single-story in the dry upland forest Potential Vegetation Group) for white-headed woodpecker (per decade).	12,000 acres
Increase the amount and quality of source habitat (open canopy dry/moist upland forest potential vegetation group) for western bluebird and Cassin's finch (per decade).	78,000 acres (bluebird)
Restore habitat quality and connectivity within and between stronghold watersheds for aquatic species, with emphasis on strongholds for Endangered Species Act listed aquatic species.	3-5 subwatersheds or 60-100 stream miles
Develop and implement habitat management plans for Spalding's catchfly key conservation areas.	Lick Creek key conservation area (also called Blue Mtn. Foothills)

Objective	Measure
1.4 Disturbance Processes	
1.4.1 Wildland Fire	
Over the next 10 years, treat stands using silvicultural treatments and/or prescribed burning (planned ignitions) to move towards fire regime condition class 1 and 2 in the dry upland forest potential vegetation groups or to protect values at risk from wildland fire.	114,000 acres
Over the next 10 years, treat stands using silvicultural treatments and/or prescribed burning (planned ignitions) to move towards fire regime condition class 1 and 2 in the moist upland forest potential vegetation group or to protect values at risk from wildland fire.	21,000 acres
Over the next 10 years, manage wildfires (unplanned ignitions) to meet desired conditions: modify species composition, stand density, structural stages, fire frequency, and fire severity to move fire regime condition class 2 and 3 to fire regime condition class 1 and 2.	45,000 acres
1.4.2 Insects and Diseases	**-**
Within the dry upland forest potential vegetation group, over the next 10 years, treat stands using silvicultural methods or wildland fire to mitigate risk of damage from insects and diseases, and maintain low or moderate susceptibility.	124,000 acres
Within the moist upland forest potential vegetation group, over the next 10 years, treat stands using silvicultural methods or wildland fire to mitigate risk of damage from insects and diseases, and maintain low or moderate susceptibility.	23,000 acres
1.5 Invasive Species	
Reduce current infestations of invasive plant species.	7,000 acres
1.6 Structural Stages	
Over the next 10 years, decrease mid-age multi-story forest (understory reinitiation stage) in the dry and moist upland forest potential vegetation groups by continuing to manage towards a large diameter (old forest) condition.	118,000 acres
Over the next 10 years, increase old forest single-story (open canopy) in the dry upland forest potential vegetation group by converting old forest multi-story to old forest single-story.	5,000 acres
1.7 Plant Species Composition	
Over the next 10 years, reduce the proportion of shade tolerant species within in the dry upland forest potential vegetation group.	123,000 acres
Manage rangeland vegetation to improve phases C and D to phase A or B.	8,790 acres
1.8 Stand Density	
Over the next 10 years, reduce the dry and moist upland forest potential vegetation groups that are in the closed stand density class	56,000 acres

Objective	Measure
1.10 Soil Quality	
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road realignment and improving forest vegetation conditions.	200-400 acres
Restore soil function (also see objectives for 1.1 Watershed Function).	175-350 acres
1.11 Water Quality	
Improve water quality through implementation of water quality restoration plans.	5-7 watersheds, 200-280 stream miles
2.3 Hunting and Fishing	
2.3.1 Rocky Mountain Elk	
Increase instances of elk occupancy and use of National Forest System lands by: moving towards vegetative desired conditions and objectives to promote a mosaic patchwork of hiding cover and forage; and providing a continuum of effective elk security in strategic locations. See objectives for vegetation (1.1, 1.4-1.8, and 1.12). See objectives for 2.7.	Within 7 years of plan approval, improve elk security to within Desired Condition range (30 to 100%) throughout 50% of the priority subwatershed. Within 15 years of plan approval, improve elk security to within Desired Condition range (30 to 100%) throughout 100% of the priority subwatershed. Within the life of the plan, improve elk security to within Desired Condition range (30 to 100%) throughout 50% of General Forest MA 4A
2.5 Roads and Trails Access	
Maintain the road system for safe and efficient travel and for the protection, management, and use of National Forest System lands.	Miles (mi) of road maintenance: 200 miles maintenance levels (ML) 4/5, 200 miles ML 3, 140 miles ML 2
3.3 Goods and Services	
Contribute to local economies by harvesting sawlogs and timber volume other than sawlogs (Timber Sale Program Quantity annually over the next decade).	56 MMBF
Contribute to local economies by providing forage for cattle and sheep.	49,200 AUMS (annually)

AUM = animal unit month, MMBF = millions of board

1. Unless otherwise indicated, the objectives are expected to be accomplished during the first decade of the plan period.
2. All measures are proposed in priority watersheds.

Annual Anticipated Accomplishments for the Umatilla National Forest

The following tables display the anticipated vegetation management-related accomplishments (related to the objectives) that are expected to take place annually as the Forest Service strives to achieve or maintain desired conditions or both. These anticipated accomplishments are not commitments or final decisions approving projects, nor are they targets or guarantees of future accomplishments. They are a means of measuring program progress toward achieving desired conditions. While the Forest Service will make every effort to achieve the following accomplishments, actual accomplishments may exceed or fall below these estimates, depending on yearly budgets and conditions at the time. Table 33 displays the anticipated vegetation management-related accomplishments (related to the objectives) that are expected to take place annually.

Long-term Sustained Yield Capacity and Allowable Sale Quantity

The long-term sustained yield capacity for the Umatilla National Forest is the highest uniform wood yield from lands being managed for timber production that may be sustained under specified management intensities consistent with multiple-use objectives. Another key disclosure of the Forest Plan is the identification of the allowable sale quantity of timber. The allowable sale quantity is the average annual amount of commercial timber that can be sold from National Forest System lands that are suitable for timber production (see Table 34). Although the allowable sale quantity is identified as an average annual quantity, the amount produced in any one year may surpass the identified allowable sale quantity so long as the totals per decade are not exceeded. The long-term sustained yield capacity and allowable sale quantity are presented below in million board feet (MMBF).

- Long-term sustained yield capacity = 61 MMBF
- Average annual allowable sale quantity = 53 MMBF

Table 33. Average annual anticipated accomplishments related to objectives

Activity	Value
Even-aged regeneration harvest (acres)	1,250
Uneven-aged and intermediate harvest (acres)	6,150
Total Timber Harvest (acres)	**7,400**
Planting (acres)	1,000
Precommercial thinning (acres)	1,400
Burning and mechanical treatment of fuels (acres)	17,400
Suppressing invasive plants (acres)	4,000
Cattle and sheep grazing (AUMS)	49,200

Table 34. Planned timber sale program annual average volume outputs for 1st decade

Lands *Suitable* For Timber Production	**MMBF**
A. Sawtimber	45.6
B. Non-saw products	1.4
Lands *Not Suitable* For Timber Production	**MMBF**
C. Sawtimber	8.7
D. Non-saw products	0.3
Timber Sale Program Quantity (TSPQ) (Total of A – D.)	56.0

MMBF = millions of board feet

Part 3 – Design Criteria

Introduction

Design criteria are used in combination with goals and desired conditions, objectives, and suitable uses to guide the management of the Umatilla National Forest. Design criteria include standards and guidelines. Standards and guidelines are sideboards that impose limitations on activities or uses for reasons of environmental protection, public safety, risk reduction, or to achieve desired conditions (goals) and objectives. These standards and guidelines will apply to all project decisions and implementations made following Forest Plan approval.

Direction for managing National Forest System lands comes from a variety of sources, including the Code of Federal Regulations and the Forest Service Directive System, which consists of the Forest Service Manual and the Forest Service Handbook. Laws, regulations, and other agency policy and directives are generally not repeated in the Forest Plan and are not repeated in these standards and guidelines. For example, threatened and endangered species have very specific direction in law, regulation, policy, agency directives, and other sources, such as recovery plans. Therefore, standards and guidelines for threatened and endangered species are limited. If a particular resource is not addressed in these standards and guidelines, it does not mean the resource is not managed or that the Forest Service considers a particular resource less important than those listed.

None of the management direction contained in this Plan is intended to prevent appropriate actions needed to protect human health and safety. This part of the Forest Plan includes both forestwide and management area specific standards and guidelines. Forestwide design criteria applies to all management areas.

Standards are mandatory constraints upon project and activity decisionmaking. They are established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Guidelines are a constraint on project and activity decisionmaking that allows for departure from its terms, so long as the purpose of the guideline is met. Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements. Guidelines serve the same purpose as standards but they differ from standards in that they provide flexibility in defining compliance, while standards are absolute constraints.

Neither standards nor guidelines are commitments or final decisions approving projects and activities. Standards and guidelines do not compel or force action; they apply only when an action is being taken.

Forestwide Standards and Guidelines

Forestwide standards and guidelines are organized by resource or management action. Those ending in “S” are standards, while those ending in “G” are guidelines.

GOAL 1: Promote Ecological Integrity

1.1 Watershed Function

KW-1S In key watersheds or subwatersheds with Endangered Species Act critical habitat for aquatic species or subwatersheds containing listed aquatic species that are functioning properly[5] there shall be no net increase (1 mile of road-related risk reduction for every new mile of road construction), where they are functioning-at-risk,[6] there shall be a net decrease (1.5 miles of road-related risk reduction for every new mile of road construction), and where they are impaired function,[7] there shall be a net decrease (2.0 miles of road-related risk reduction for every new mile of road construction) in system roads that affect hydrologic function. Priority for road-related risk reduction shall be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems. Road-related risk reduction will occur prior to new road construction unless logistical restrictions require post-construction risk reduction. This standard shall apply to the affected subwatershed when new system road construction is proposed in that subwatershed, and shall not be offset by reductions in open-road densities in other subwatersheds.

KW-2S In key watersheds and subwatersheds with Endangered Species Act critical habitat for aquatic species or subwatersheds containing listed aquatic species, hydroelectric and other surface water development authorizations shall include requirements for in-stream flows and habitat conditions that maintain or restore native fish and other desired aquatic species populations, riparian dependent resources, favorable channel conditions, and aquatic connectivity.

KW-3S In key watersheds and in subwatersheds with Endangered Species Act critical habitat for aquatic species or subwatersheds containing listed aquatic species, new hydroelectric facilities and water developments shall not be located in a key watershed unless it can be demonstrated that there are minimal risks and/or no adverse effects to the fish and water resources for which the key watershed was established.

WM-1S When watershed function[8] desired conditions are being achieved and watersheds are functioning properly[9], projects shall maintain[10] those conditions. When watershed function desired conditions are not yet achieved or watersheds have

[5] "Functioning properly", "functioning-at-risk", and "impaired function" for the roads and trails indicator of Watershed Condition Framework are defined in Watershed Condition Framework Technical Guide, USDA Forest Service, 2011b. Local inventory, assessment and monitoring data and information can be used to refine initial classifications made per Watershed Condition Framework.
[6] "Functioning properly", "functioning-at-risk", and "impaired function" for the roads and trails indicator of Watershed Condition Framework are defined in Watershed Condition Framework Technical Guide, USDA Forest Service, 2011b.
[7] "Functioning properly", "functioning-at-risk", and "impaired function" for the roads and trails indicator of Watershed Condition Framework are defined in Watershed Condition Framework Technical Guide, USDA Forest Service, 2011b.
[8] Per Revised Forest Plan Watershed Function desired conditions (watershed function, hydrologic, riparian, wetland, stream channel, groundwater dependent ecosystem, and aquatic habitat).
[9] The Watershed Condition Framework categories of terminology for "functioning properly," "functioning-at-risk," and impaired function are equivalent to the "functioning appropriately" "functioning-at-risk" and "functioning at unacceptable risk" categories within the matrix of pathways and indicators (USFWS 1998), and to the respectively equivalent to "properly functioning" or "at risk" or "not properly functioning" categories within the matrix of pathways and indicators used by National Marine Fisheries Service (1996).
[10] See glossary in the Blue Mountains ARCS (Appendix A) for definitions of "maintain" and "degrade."

impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects shall restore[11] or not retard[12] attainment of desired conditions. Short-term adverse effects[13] from project activities may occur when they support or do not diminish long-term recovery[14] of watershed function desired conditions and federally listed species. Exceptions to this standard include situations where Forest Service authorities are limited (Alaska National Interest Lands Conservation Act, 1872 Mining law, valid state water rights, etc.). In those cases, project effects shall be minimized and not retard attainment of desired conditions for watershed function to the extent possible within Forest Service authorities. Use Blue Mountains ARCS Appendix A to assist in determining compliance with this standard.

WM-2S All projects shall be implemented in accordance with best management practices, as described in national and regional technical guides.

RE-1G Watershed restoration projects should be designed to utilize or emulate natural ecological processes to the extent practicable, for meeting and maintaining restoration objectives.

RE-2G Watershed restoration projects should be designed to minimize the need for long-term maintenance.

RE-3S Except where Forest Service authorities are limited, mitigation or planned restoration shall not be used as a substitute for preventing long-term watershed or habitat degradation.

RE-4S Hydrologic connectivity and sediment delivery from roads and trails shall be minimized. This includes roads, or road segments, whether inside and outside of riparian management areas, that deliver sediment to streams.

1.2 Species Diversity

SD-1G To the extent practical, known cavity or nest trees should be preserved when conducting prescribed (planned ignition) burning activities, mechanical fuel treatments, and silvicultural treatments to protect the integrity of the nest site.

SD-2G Known bat maternity and roost sites should not be disturbed to minimize disturbance to bats during critical times and to protect the integrity of the site.

SD-3G With the exception of the removal of danger/hazard trees or fuel treatments within the wildland-urban interface, when a need to harvest or destroy snags is identified as part of a silvicultural treatment, current conditions should be evaluated relative to the desired conditions tables for each snag size class (see Sec. 1.15, Table 13 and 16) and:

- Treatments should be limited to the extent that they will not result in a desired size-density category becoming underrepresented relative to desired conditions.

[11] See glossary in the Blue Mountains ARCS (Appendix A) for definitions of “restore.”
[12] See glossary in the Blue Mountain ARCS (Appendix A) for definitions of “retard attainment.”
[13] See glossary in the Blue Mountain ARCS (Appendix A) for definition of “short-term adverse effects.”
[14] See glossary in the Blue Mountain ARCS (Appendix A) for definition of “long-term recovery.”

- If an area is determined to be currently underrepresented in one or more of the desired size-density categories, snags should be retained within treatment units in quantities that will contribute to the highest density levels that are currently underrepresented.
- Areas containing very low levels (less than 1 per acre) of snags as a result of the treatment should not exceed 10 contiguous acres in the dry upland forest potential vegetation group, or 5 contiguous acres within all other potential vegetation groups to assure a sufficient supply of habitat for snag-dependent wildlife species

SD-4G In addition to the requirements of guideline SD-3G, if a need for post-fire salvage harvesting is identified, current conditions should also be evaluated relative to the desired conditions table pertaining to post-fire habitat, (see Sec. 1.15, Table 15) and (see next items):

- Post-fire salvage treatments should be limited to the extent that the desired potential vegetation group proportions for post-fire habitat are currently being exceeded.
- Post-fire salvage should generally not occur following individual fire events of less than 100 acres, except within the wildland-urban interface or where necessary for the removal of danger/hazard trees.

SD-6G[15] Management activities within one mile of a known active (during same calendar year that use is documented) wolf den and rendezvous sites should implement appropriate seasonal restrictions based on site specific consideration and potential activity effects, to reduce disturbance to denning wolves.

SD-7G[15] Do not authorize turnout of sick or injured livestock to reduce risk of attracting wolves.

SD-8G[15] Remove or otherwise dispose of livestock carcasses such that the carcass will not attract wolves. If, due to location of the carcass, this is not possible, develop other remedies.

SD-9G[15] Do not authorize salt or other livestock attractants near known active (during same calendar year that use is documented) wolf dens or rendezvous sites to minimize livestock use of these sites.

1.3 Federally Listed Species

RE-5S Minimize adverse effects to federally listed, proposed, and candidate species and their designated and proposed critical habitat in accordance with Forest Service authorities. Management activities shall not retard recovery[16] of listed, proposed, and candidate species and their designated and proposed critical habitat in the long-term in accordance with Forest Service authorities. Federally listed, proposed, and candidate species and their designated and proposed critical habitats shall be

[15] Applies to all wolves on the national forest, regardless of whether they are federally listed or non-listed.

[16] Retard recovery: management action effects that, individually or in combination with other management actions or natural disturbances, measurably slow the natural rate of recovery.

managed in accordance with their recovery or other conservation plans, in accordance with Forest Service authorities.

FLS-1G Management activities should avoid adverse impacts to wolverine and its habitat to maintain population viability and avoid a trend towards federal listing.

FLS-2G Livestock grazing should not be authorized in the peatlands sensitive plant habitat group, to protect the fragile habitat from trampling.

FLS-3S Maximum utilization of key forage species shall not exceed 30 percent in occupied habitat of threatened, endangered, proposed or candidate plant species, except where an approved conservation strategy, conservation agreement, or recovery plan recommends an alternate use level.

FLS-4G Maximum utilization of key forage species should not exceed 30 percent in occupied habitat of sensitive plant species, except where an approved conservation strategy or conservation agreement recommends an alternate use level.

FLS-5G New water developments and salting should not be authorized within one-quarter mile of occupied habitat of threatened, endangered, candidate or sensitive plant species to reduce concentrated livestock use and its associated impacts (e.g., excessive trampling, soil compaction and herbivory).

FLS-6S Timber harvest and associated vegetation management activities shall avoid adverse effects to the occupied habitat of threatened, endangered, proposed, candidate and sensitive plant species unless the silvicultural prescription would benefit the species or its habitat.

FLS-7G Slash piles and other fuels should be managed to avoid the occupied habitat of threatened, endangered, proposed or candidate plant species unless the burn plan or prescription would benefit the species or its habitat.

FLS-8G Construct fire control lines to avoid the occupied habitat of threatened, endangered, proposed, candidate and sensitive plant species to minimize adverse effects and impacts to these categories of plant species except where needed to provide for the protection of human life and public safety.

FLS-9S Road maintenance and new road construction shall be designed to minimize adverse effects to the occupied habitat of threatened, endangered, proposed, or candidate plant species.

FLS-10G New road construction should be designed to minimize adverse impacts to the occupied habitat of sensitive plant species to avoid a trend towards federal listing.

FLS-11S Trail maintenance and new trail construction shall be designed to avoid adverse effects to the occupied habitat of threatened, endangered, and proposed plant species.

FLS-12S Recreation areas (e.g., ski areas) and other recreational activities shall minimize adverse impact to whitebark pine and its habitat.

FLS-13G Trail maintenance and new trail construction should be designed to avoid adverse impacts to the occupied habitat of sensitive plant species to avoid a trend towards federal listing.

FLS-14G Leasable Minerals: Consent to mineral leases should be given with stipulations to minimize adverse effects to threatened and endangered species. Active minerals leases should be mitigated to minimize impacts that exploration and production operations may have on threatened and endangered species. Where exploration or mineral production activities cannot avoid or minimize the effects of operations, utilize compensatory mitigation to enhance off-site habitats and to support no net loss or, if possible, a net benefit for threatened or endangered species.

Locatable Minerals: Locatable mineral operations should be mitigated within the context of the Forest Service regulations at 36 CFR 228 to protect threatened and endangered plant species from the effects of exploration and mining activities.

LH-4G Land exchanges should avoid the disposition of occupied habitat of threatened, endangered, candidate, proposed, or sensitive species.

FLS-15S Livestock grazing of occupied *Silene spaldingii* habitat shall not be authorized between July 1 and September 30 (flowering-fruiting period).

FLS-16S Domestic sheep grazing shall not be authorized (during same calendar year that use is documented) in an allotment that contains a known active wolf den or rendezvous site unless a herder is with the sheep at all times and retrieves known strays within 24 hours.

1.5 Invasive Species

IS-1G Avoid cross contamination between streams, reservoirs and lakes from pumps, suction and dipping devices or any other equipment. Avoid dumping water directly from one stream or lake into another. Disinfect water storage and conveyance equipment including sampling equipment, water tenders, pumps, engines and aircraft prior to use on Forest.

IS-2S An integrated pest management approach, including early detection and rapid response, shall be used to manage pests, such as insects, diseases, and invasive or unwanted plants and animals.

IS-3G Determine appropriate range of treatments necessary to meet objectives for invasive species and native pests, while minimizing negative effects of treatments. Methods including prevention, manual, cultural, mechanical, regionally approved chemicals and biological agents may be considered within all management areas.

IS-4G Plan and conduct activities to minimize or prevent the potential spread or establishment of invasive species.

IS-5S Materials (e.g., straw, mulch, gravel, rock, fill, or soil) used for construction or restoration projects on National Forest System lands shall be weed-free. If State-certified straw or mulch is not available, individual forests should require sources certified to be weed-free using the North American Weed Free Forage Program standards or a similar certification process.

IS-6S Equipment used for actions conducted or authorized by written permit or contract by the Forest Service that will operate outside the limits of the road prism shall be weed- and pest-free prior to entering National Forest System lands.

IS-7S Pelletized or certified weed-free feed shall be used on all National Forest System lands. If State-certified weed-free feed is not available, feed certified weed-free using North American Weed-Free Forage Program standards or a similar certification process may be used.

IS-8G Restore or revegetate sites disturbed by management activities, including sites treated specifically to control invasive plants, to prevent the introduction or spread of invasive species.

IS-9G To avoid or minimize exposure to pesticides, treatment areas should be posted to inform the public and forest workers of application dates and pesticides used.

1.9 Air Quality

AQ-1S Planned (prescribed) burning shall be conducted in accordance with State smoke management plans in Oregon and Washington, as applicable.

1.10 Soil Quality

SQ-1S Design project activity units to result in no more than 20 percent detrimental soil disturbance at project conclusion.

SQ-2S After completion of management activities, the minimum effective ground cover within each activity unit shall be in place to prevent erosion from exceeding background erosion rates for each of four established erosion hazard classes: low, medium, high, or very high (see Table 35). Effective ground cover can include rocks, woody debris, vegetation, or other elements.

Table 35. Required minimum percent of effective ground cover (EGC) in the first and second years after an activity for each erosion hazard class

Erosion Hazard Class	Required Minimum % Effective Ground Cover (EGC) 1st year following activity	Required Minimum % Effective Ground Cover (EGC) 2nd year following activity
Low (Very Slight)	20%-30%	30%-40%
Medium (Moderate)	31%-45%	41%-60%
High (Severe)	46%-60%	61%-75%
Very High (Very Severe)	61%-75%	76%-90%

SQ-3S Management actions shall be designed to avoid the potential for triggering landslides.

SQ-4G Mechanical fireline should not be constructed in areas with greater than 35 percent slope or on highly erodible soils unless potential detrimental effects can be mitigated.

1.14 Old Forest and Individual Old/Large Trees

OF-1G Management activities should retain and generally emphasize recruitment of old[17] trees, large[18] trees and legacy[19] trees. Exceptions where individual old, large or legacy trees may be removed or destroyed include situations where:

- Trees need to be removed to meet or maintain desired conditions for species composition on the landscape by removing shade tolerant species in favor of shade-intolerant species. (see Desired Conditions Sec. 1.7)
- Trees need to be removed from high density forest to meet or maintain desired conditions for low density stand conditions on the landscape where removal of smaller trees alone cannot achieve desired conditions.
- Trees need to be removed to control or limit the spread of insect or disease infestation.
- Trees need to be removed to reduce danger/hazard trees along roads or in developed sites.
- Trees need to be removed where strategically critical to reinforce, facilitate, or improve effectiveness of fuel reduction in wildland-urban interfaces.

Additional exception applies only to large trees that do not also meet the definition of old trees:

- Trees need to be removed to favor aspen, cottonwood, whitebark pine or other special plant habitats.
- Trees needed to be removed to form key pieces in complex instream large wood structures.

GOAL 2: Promote Social Well-Being

2.1 Scenery

SC-1G Short-term reductions to existing scenic integrity levels should be authorized only when needed to achieve long-term ecosystem restoration or to improve scenic integrity and/or scenic stability.

SC-2S Project level decisions and implementation activities shall be consistent with the scenic integrity objectives associated with mapped scenic classes.

[17] For the purpose of this guideline, the definition for the terms are as follows: "Old" trees are live trees with distinct features indicating ages of generally 150 years or older (see guidelines outlined in Van Pelt 2008).
[18] "Large" trees are live grand fir over 30-inches diameter at breast height or live trees of any other species over 21 inches diameter at breast height.
[19] "Legacy" trees are old trees that have been spared during past harvest or have survived stand-replacing natural disturbances and are thus significantly older than the average trees in the general area. This distinguishes them from other 'residual' trees, which may also have been spared from harvest but are not always significantly older than the average trees in the area (Mazurek and Zielinski 2004; Franklin 1990). Legacy trees of particular value to wildlife include those that are also large, rough-boled with dead horizontal limbs, have witch's broom deformities, are hollow, have heart rot, pockets of decay, dead or broken tops, cavities and/or substantial wounds (Bull et al. 1997).

2.2 Recreation

REC-1G Recreation-related project-level decisions and implementation activities should be consistent with mapped classes and setting descriptions in the recreation opportunity spectrum.

2.3.1 Rocky Mountain Elk

RME-1S There shall be no net loss of elk security measured within watersheds (5th-field HUC) through building of new motorized routes or reopening of closed motorized routes for public travel.

RME-2G Motorized travel on system roads, trails and areas open to motorized vehicle use should not be authorized within elk winter range between December 1 and April 14. These dates may be modified by as much as, but not exceed two weeks (e.g., March 31, April 30) as appropriate in consultation with State wildlife agencies. Federal and state highways and major forest system roads (such as arterials) may be exempted from this guideline to provide reasonable public access. Authorized administrative use of forest system roads also may be exempted from this guideline.

The intent is to minimize disturbance to elk while occupying winter range and encourage elk use of public land. Elk winter range maps in the planning record should be used as the basis for identifying winter range for future projects.

RME-3G Encourage elk use of Forest Service lands. Management activities that fall within identified elk priority areas should increase security by a minimum of 15 percent, to reach 30 percent or greater at the subwatershed (6th-field HUC) scale. This guideline applies to projects that affect security and/or treat greater than 500 acres of forested vegetation (prescribed fire is exempt).

The intent is to improve distribution of elk across all seasonal ranges on National Forest System lands by moving toward and/or within the desired condition range of 30-100 percent elk security. Project effects analyses should identify and consider elk security, elk forage/nutrition, elk hiding cover, and elk habitat selection and distribution.

2.3.2 Bighorn Sheep

BHSM-1S Domestic sheep or goat grazing, trailing of domestic sheep or goats, or the use of domestic goats or sheep for manipulation of vegetation (i.e., noxious weed control, fuels reduction) shall not be authorized where effective separation[20] from bighorn sheep cannot be reasonably maintained. Effective separation between bighorn sheep and domestic sheep and goats is determined with a site-specific analysis.

BHSM-2S The use of pack goats shall not be authorized in occupied bighorn sheep habitat or where effective separation from bighorn sheep cannot be reasonably maintained.

[20] Effective separation is determined on a site specific basis through a quantitative and qualitative analysis that includes the following considerations:

- bighorn sheep herd size and relevant population parameters;
- proximity of domestic sheep or goats to bighorn sheep;
- permeability of the area separating bighorn sheep from permitted domestic sheep or domestic goats; and
- management practices that contribute to maintaining effective separation between these species.

BHSM-3S Permitted domestic sheep and goats shall be counted onto and off of the allotment by the permittee. A reasonable effort to account for the disposition of any missing domestic sheep or goats must be made by the livestock grazing permittee and reported back to the Forest Service within 24 hours.

BHSM-4S Domestic sheep and goats shall be individually marked in a manner that allows field identification of ownership when on National Forest System lands.

BHSM-5S To maintain effective separation, when bighorn sheep presence is likely to result in association with domestic sheep or goats, the Forest Service shall:

- notify the appropriate State agency
- implement actions that minimize the risk of contact between bighorns and domestic sheep or goats. This may involve rerouting within the permitted allotment, movement to a different allotment, or, if the situation cannot otherwise be resolved, moving the permitted sheep off the national forest until the situation can be resolved.

2.4 Cultural Resources

CR-1S Prehistoric, historic, and traditional cultural properties shall be protected unless an exemption is specified in a programmatic agreement or a project specific mitigation plan is developed in consultation with the appropriate State Historic Preservation Officer and affected Indian Tribe(s).

2.5 Roads and Trails Access

RT-1G Limit motorized vehicles to roads, trails, and areas that are designated for use in the Umatilla National Forest Motorized Access and Travel Management Plan. Temporary exceptions are authorized for those conducting official duties including firefighting, organized rescues, duties by special use permit or contract, and others listed in the Forest Motorized Access and Management Plan or having the district ranger's authorization.

2.7 Tribal Rights and Interest

TR-1S The Umatilla staff shall use consultation processes established with American Indian tribal governments to identify and manage areas and resources of tribal importance on National Forest System lands.

TR-2G Forest Service managers should take into account project effects to culturally significant foods prior to tribal consultation efforts.

GOAL 3: Promote Economic Well-Being

3.2 Land Ownership

LO-1G Use stipulations for permits and leases to protect sensitive resources, and exclude leasable and common mineral and energy development from areas in which such use is incompatible with mineral or energy development.

LO-2G Landownership adjustments should emphasize the following objectives: (a) acquisition to meet identified resource management needs, (b) acquisition contributing to consolidation that reduces administrative problems and costs and

further enhances public use, and (c) conveyance of land better suited for non-Federal ownership.

3.3.1 Forest Products

FP-1S As directed by the National Forest Management Act, cut blocks, patches, strips or other forest openings created by the application of even-aged or two-aged regeneration harvest methods shall be limited to a maximum size of 40 acres. Where units larger than 40 acres are considered likely to produce a more desirable combination of net public benefits, harvest openings larger than 40 acres may be permitted on an individual timber sale basis after 60 days' public notice and review by the Regional Forester. This maximum size opening limitation does not apply to areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm.

FP-2S As directed by the National Forest Management Act, cut blocks, patches, or strips created by the application of even-aged or two-aged regeneration harvest methods shall be shaped and blended with the natural terrain.

FP-3S As directed by the National Forest Management Act, clearcutting and other even-aged harvests may be used only when developed through interdisciplinary review that assesses the projects impacts through appropriate environmental documentation and a finding that the project is consistent with the multiple uses of the general area.

FP-4S As directed by the National Forest Management Act, the harvesting systems chosen for a project shall not be selected primarily because they give the greatest dollar return or the greatest output of timber.

FP-5S As directed by the National Forest Management Act, clearcutting shall be used only where it is determined to be the optimum method for meeting desired conditions.

FP-6S Timber harvest on lands not suitable for timber production shall occur only to meet desired conditions other than timber production.

FP-7G The silvicultural systems used to manage forest vegetation should be consistent with those shown, by forest vegetation type, as shown in Table 36. All intermediate silvicultural tending treatments including but not limited to commercial and pre-commercial thinning, improvement cuttings, sanitation/salvage, prescribed fire, tree planting, pruning, site preparation or mechanical fuel reduction may be incorporated into these systems if use is consistent with other plan components.

Table 36. Appropriate silvicultural system

Forest Vegetation Group or Cover Type	Even-Aged	Two-Aged [1]	Uneven-Aged
Cold upland forest	Clearcutting; Overstory Removal; Clearcutting-Salvage; Seed Tree; Shelterwood	Clearcutting; Overstory Removal w/Reserves; Seed Tree w/Reserves; Shelterwood w/Reserves	Single Tree Selection; Group Selection
Moist upland forest	Clearcutting; Overstory Removal; Clearcutting-Salvage; Seed Tree; Shelterwood	Clearcutting; Overstory Removal w/Reserves; Seed Tree w/Reserves; Shelterwood w/Reserves	Single Tree Selection; Group Selection
Dry upland forest	Overstory Removal; Clearcutting-Salvage; Seed Tree; Shelterwood	Overstory Removal w/Reserves; Seed Tree w/Reserves; Shelterwood w/Reserves	Single Tree Selection; Group Selection

1. Cuts in two-aged systems are a form of even-aged management and must comply with National Forest Management Act limitations for even-aged regeneration harvests.

3.3.2 Livestock Grazing

LG-1G Grazing after fire (planned and unplanned ignitions) should be managed so as not to cause a trend away from the native or desired nonnative species desired condition. This may include deferment for one or more growing seasons following unplanned fire, which will be defined at the project level when restoration needs are assessed.

LG-2S All new water developments shall provide for small mammal and bird escape.

LG-3G In areas classified as less than fully capable or suitable for grazing, only limited livestock use should be authorized after the limitations of the site are considered in designing the site-specific allotment management plan.

LG-4G Upland Forage Utilization Guideline: Maximum percent utilization by management system (Table 37). Utilization should be based on a point in time measurement. Utilization accounts for reduction in forage by wildfire and all use by permitted livestock, wildlife, insects, or recreational use. Utilization will be based on height-weight curves and/or ocular estimates or other approved measures. Utilization is based on key species.

Table 37. Upland Forage Utilization Guideline: Maximum percent forage utilization by management system*

Management System	Low to Moderate Departure from Desired Condition[1]	Moderate or Greater Departure from Desired Condition[2]
Season long	35%	30%
Management systems that incorporate deferment, rest, rotation	40%	35%

* Refer to MA 4B standards and guidelines for management direction for grazing within riparian management areas.)

1. Low to moderate departure from Desired Condition: phase A or B
2. Moderate or greater departure from Desired Condition: phase C or D

LG-5G To maintain plant diversity and productivity, upland shrub utilization of annual leader growth should not exceed 40 percent as determined by a science-based method, to maintain shrub health and reproduction capability.

3.3.3 Special Uses

SU-1G Wind towers should be placed to avoid areas of high scenic integrity.

SU-2G Wind towers should be placed to avoid areas where natural topography, such as ridgetops, saddles, or mountain passes, create preferred travel, foraging, or migration routes for migratory birds, raptors, or bats.

SU-3G Any development of wind energy and associated infrastructure within the Plan Area will consider and mitigate negative impacts to wildlife.

3.3.4 Mineral, Energy, and Geological Resources

ME-1S Roads for mineral operations shall not be constructed prior to approval of a plan of operations and shall be designed and located to provide adequate protection to surface resources, including but not limited to slope stability, surface erosion, and water quality.

ME-2S The collection of vertebrate fossils from National Forest System lands is prohibited, except by permit to authorized individuals.

Management Area Standards and Guidelines

The following standards and guidelines are organized by management area first and then by resource or management activity and apply only to the associated management area. Each standard and guideline has an alpha-numeric identifier. Those ending in “S” are standards, while those ending in “G” are guidelines.

MA 1A Congressionally Designated Wilderness Areas

MA1A-1S Pets (such as dogs or other domestic animals that are not categorized as stock) may be authorized so long as their presence does not interfere with wildlife or contribute to resource impacts or user conflicts. Pets should be fully controlled by their owner through voice commands, a leash, or other restraint (such as an electronic collar).

MA1A-2S Wheeled vehicles, such as wagons and game carts, shall not be authorized in wilderness areas.

MA1A-3G Party sizes greater than 12 people and/or with more than 18 head of stock should not be authorized within wilderness areas to maintain wilderness character.

MA1A-4G The hitching or tethering of a horse or other saddle or pack animal should not be authorized within 200 feet of lakes or within 100 feet of streams and posted wetlands in wilderness areas to maintain wilderness character.

MA1A-5S Storing or abandoning personal property, equipment, and supplies for more than 72 hours in wilderness areas shall not be authorized.

MA1A-7G Camping and campfires should not be authorized within 200 feet of lakes, streams, or other camps within wilderness areas in order to maintain wilderness character.

MA1A-16S Hitching or tethering of horses or other saddle or pack animals to trees, except for loading or unloading, shall not be authorized at campsites within wilderness areas

MA 1A Wildland Fire Management Activities in Wilderness

MA1A-17G To maintain wilderness character, all firelines should be restored by actions such as scattering slash piles along and onto firelines, knocking down or burning all slash piles greater than 18 inches tall, pulling back and covering all sod with slash, and placing boulders, logs, and slash on firelines to discourage use and camouflage entrance points.

Additionally, all firelines within 100 feet of intercepting trails, roads, or stream crossings should be restored by cutting stumps flush and close to the ground (height of 4 to 5 inches), covering tops with a layer of soil (1 to 2 inches), and chopping and roughening the ends of logs and stumps.

MA1A-18G Waterbars should be constructed on fireline slopes that exceed 10 percent in order to maintain wilderness character.

MA1A-19G Camps should be restored by replacing logs and rocks, recontouring terrain, scarifying soil, and scattering twigs, rocks, and dead branches to discourage use and camouflage entrance points to maintain wilderness character.

MA1A-20G Closed roads that were opened to provide access to wilderness areas should be closed after the use has concluded to maintain wilderness character.

MA1A-21G Wilderness trails used as firelines should be returned to original condition after the use has concluded in order to maintain wilderness character.

MA 1B Recommended Wilderness Areas

MA1B-1S Proposed uses that could compromise wilderness area eligibility prior to congressional designation shall not be authorized.

MA1B-2G Mechanized (bicycle) use and nonmotorized travel may occur on existing trails in recommended wilderness areas.

MA1B-3G Motorized equipment including chain saws and trail machines may be used for trail maintenance and reconstruction on existing trails within recommended wilderness areas.

MA 2A Wild and Scenic Rivers (Includes Designated, Eligible, and Suitable)

MA2A-1G New proposals for outfitting and guiding special use permits or recreation event permits should be approved only when the special use or event is consistent with outstandingly remarkable values, wild and scenic rivers desired conditions, and when a need is identified and capacity is available.

MA2A-2S Hitching or tethering of horses or other saddle or pack animals to trees, except for loading or unloading, shall not be authorized at campsites within wild and scenic river corridors.

MA2A-3S New roads and motorized trails shall not be authorized within wild classifications of wild and scenic river management allocations.

MA2A-4S Hazard trees felled at trailheads or watercraft put-in/takeout locations within river segments classified as wild rivers will be left where they fall, or moved to an ecologically desirable location.

MA2A-5S Mining of common minerals shall not be authorized.

MA 2B Research Natural Areas

MA2B-1S Management activities shall not be authorized that inhibit the purpose for the research natural area establishment.

MA2B-2G Mineral exploration and development activities should be managed to minimize impacts to research natural areas, consistent with valid existing rights.

MA2B-3S Removal of common mineral material shall not be authorized within research natural areas.

MA 2C Botanical Areas

MA2C-1G Visitor activities should be managed to avoid degradation to botanical areas.

MA2C-2G Interpretive facilities should not conflict with the overall purpose of establishing botanical areas.

MA2C-3G Silvicultural treatments should not degrade the special features of botanical areas.

MA2C-4G To prevent damage to special features, firewood collection should not be authorized within botanical areas.

MA2C-5G Mineral exploration and development activities should be managed to minimize impacts to botanical areas.

MA2C-6G Removal of common mineral material should not be authorized within botanical areas unless doing so will not adversely modify special features.

MA2C-7G Utility corridors should not be authorized within botanical areas, unless doing so will not adversely modify special botanical features.

MA2C-8G Artificial control of endemic (normal) levels of insects and diseases should not be authorized within botanical areas, to retain natural processes and influences.

MA 2D Geological Areas

MA2D-1G Management activities should not reduce or impair the natural and ecological values and qualities for which the area was designated.

MA 2E Historical Areas

MA2E-1G Visitor activities should be managed to avoid degradation to historical areas, and interpretive facilities should not conflict with the overall purpose of designated historical areas.

MA 2F Scenic Byways and All American Roads

MA2F-1G Visual impacts from vegetation treatments, recreation uses, rangeland developments, and other structures should blend with the overall landscape character along scenic byways.

MA2F-2G Signs, kiosks, and other exhibits should provide interpretive, education, and safety information along scenic byways and in adjacent recreation sites.

MA 2G Nationally Designated Trails

MA2G-1G Management activities should not reduce or impair the scenic, historic, and recreational values and qualities for which the trail was designated.

MA 2H Scenic Areas

MA2H-1G Signs, kiosks, and other exhibits should provide interpretive, education, and safety information along scenic byways and in adjacent recreation sites.

MA 2J Municipal Watersheds

MA2J-1S All management activities shall be designed to protect water quality at the intake in public water supply watersheds. Activities that could influence drinking water sources will be conducted consistent with State and Federal water quality regulations.

MA2J-2S All fertilizers and chemicals shall only be used in emergency situations, consistent with existing agreements between individual cities and the U.S. Department of Agriculture.

MA 3A Backcountry (nonmotorized use)

MA3A-1S Backcountry management areas within inventoried roadless areas shall be managed consistent with the guidance in the 2001 Roadless Area Conservation Rule (36 CFR 294) (USDA 2001).

MA 3B Backcountry (motorized use)

MA3B-1S Backcountry management areas within inventoried roadless areas shall be managed consistent with the guidance in the 2001 Roadless Area Conservation Rule (36 CFR 294) (USDA 2001).

MA 4A General Forest

MA4A-1S As directed by the National Forest Management Act, when trees are harvested from lands identified as suitable for timber production, the harvests shall be made in such a way as to reasonably assure that the technology and knowledge exists to adequately restock the lands within 5 years of final regeneration harvest. Research and experience shall be the basis for determining whether the harvest and regeneration practices planned can be expected to result in adequate restocking. The adequate level of restocking shall be prescribed in a site-specific silviculture prescription for a project, which will specify the minimum number, size, distribution and species composition of regeneration needed based on the objectives and desired conditions for the Plan Area and project.

MA4A-2G As directed by the National Forest Management Act, even-aged regeneration harvests of stands on lands suitable for timber production should not occur until the stands have generally reached or surpassed the culmination of the mean annual increment measured in cubic feet. This does not preclude the use of thinning or other intermediate stand improvement treatments or salvage/sanitation harvesting of timber stands that are substantially damaged by fire, windthrow, or other catastrophic event or that are in imminent danger of insect or disease outbreaks. Exceptions may be made after consideration of overall multiple uses other than timber production including:

- Cutting related to research or experimental purposes, or
- Removing particular species of trees, or
- Improving wildlife habitat, range or recreation resources.

MA 4B Riparian Management Areas

RMA-1S Riparian management areas include portions of watersheds where aquatic and riparian-dependent resources receive primary management emphasis. When riparian management area desired conditions are functioning properly, projects shall protect or maintain those conditions. When riparian management area desired conditions are not yet achieved or riparian management areas have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects or permitted activities shall restore or not retard attainment of desired conditions.[21] Short-term adverse effects from project activities may occur when they support long-term recovery of riparian management area desired conditions.[22] Exceptions to this standard include situations where Forest Service authorities are limited (Alaska National Interest Lands Conservation Act, 1872 Mining law, valid state water right, etc.). In those cases, project effects shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities. Use Blue Mountains ARCS Appendix A (e.g. diagnostic indicators and riparian management area ecological process and function descriptions) to assist in determining compliance with this standard.

RMA-2S Herbicides, insecticides, pesticides and other toxicants, and other chemicals shall be applied only to maintain, protect, or enhance aquatic and riparian resources or to restore native plant communities in a manner that does not harm aquatic or riparian resources.

RMA-3S Trees felled for safety shall be retained onsite unless in excess of what is needed to achieve aquatic and riparian desired conditions. If the desired quantity and size distribution of large wood has been met on site, the wood can be transported to other aquatic and riparian restoration projects.

[21] Per Watershed Condition Framework Technical Guide, USDA Forest Service (2011b), subsequent versions of this guide and/or other comparable methods. The Watershed Condition Class terminology for functioning properly, “functioning-at-risk,” and impaired function are equivalent to “functioning appropriately” or “functioning-at-risk” and “functioning at unacceptable risk” functioning categories within the matrix of pathways and indicators (USFWS 1998), and respectively equivalent to “Properly Functioning” or “At Risk” or “Not Properly Functioning” categories within the matrix of pathways and indicators used by National Marine Fisheries Service (1996).
[22] The definitions and rationale for the terms maintain, restore, degrade, retard attainment, short term, and long term are included in Forest Plan standard WM-1S.

RMA-4G Water drafting sites should be located and managed to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat. To prevent the spread of invasive species, water should not be discharged into other waterbodies.

RMA-5S Pumps shall be screened at drafting sites to prevent entrainment of fish and shall have one-way valves to prevent back-flow into streams.

RMA-6G Fish habitat and water quality should be protected when withdrawing water for administrative purposes.

RMA-7S Refueling shall occur with appropriate containment equipment and a spill response plan in place. Wherever possible, storage of petroleum products and refueling will occur outside of riparian management areas. The use of containment devices, absorbent pads, and a developed spill plan will help reduce the risk of fuel and petroleum products from getting into streams and other waterways if an accident were to occur. If refueling or storage of petroleum products is necessary within riparian management areas, these operations will be conducted no closer than 100 feet from waterways.

MA 4B Fuels Management and Wildland (Unplanned) Fire Activities

FM-1G Locate temporary firefighting facilities (e.g., incident bases, camps, helibases, staging areas, helispots, and other centers) for incident activities outside riparian management areas. When no practical alternative exists, all appropriate measures to protect, maintain, restore, or enhance aquatic and riparian dependent resources should be used. If the only suitable location for such activities is within a riparian management area, use may be granted following review by a resource advisor and discussion with the agency administrator. The resource advisor will work with the incident management team to prescribe the location, use conditions, and rehabilitation requirements. Use an interdisciplinary team to predetermine suitable incident base and helibase locations.

FM-2G Aerial application of chemical retardant, foam, or other fire chemicals is prohibited within 300 feet (slope distance) of perennial and intermittent waterways. Waterways are defined as any body of water (including lakes, rivers, streams, and ponds) whether or not it contains aquatic life except in cases where human life or public safety is threatened and chemical use could be reasonably expected to alleviate that threat. This includes open water that may not be mapped as such on avoidance area maps and intermittent streams that are running or holding surface water at the time of retardant use.

FM-3S Portable pump set-ups shall include containment provisions for fuel spills and fuel containers shall have appropriate containment provisions. Vehicles shall be parked in locations that avoid entry of spilled fuel into streams. When drafting, pumps shall be screened at drafting sites to prevent entrainment of aquatic species, screen area shall be sized to prevent impingement on the screens, and shall have one-way valves to prevent back-flow into streams. Use National Marine Fisheries Service approved screening criteria where listed fish or critical habitat are present.

FM-4G Locate and configure firelines to minimize sedimentation to waterbodies, capture of overland and stream flows, and development of unauthorized roads and trails. Restore firelines following suppression or prescribed fire activities.

FM-5S To minimize soil damage when chipping fuels within riparian management areas, chip bed depths on dry soils shall be limited to 7.5 cm or less (Busse et al. 2006).

FM-6G Disturbed areas, such as firelines, drop-points, camps, roads, and trails, should be restored by actions such as scattering slash piles, replacing logs and boulders, scarifying soils, recontouring terrain, and reseeding with native species.

FM-7G Pumping directly from a stream channel should be avoided if chemical products are to be injected directly into the system. When chemicals are used, pumping should be conducted from a fold-a-tank that is located outside the riparian area.

FM-8G Minimum impact suppression tactics (MIST) should be used in sensitive areas, such as designated wilderness areas, designated wild and scenic river corridors, research natural areas, botanical areas, riparian management areas, cultural and historic sites, developed recreation areas, special use permit areas that have structures, and historic and recreational trails. Minimum impact suppression tactics techniques should also be used for post fire restoration activities.

FM-9G Prescribed burn direct ignition in riparian management areas should not be used unless site or project-scale effects analysis demonstrates that it would not retard attaining aquatic and riparian desired conditions.

FM-10S Ensure prescribed burn projects contribute to and do not retard the attainment of the aquatic and riparian desired conditions.

FM-11G Chemicals or retardant should not be used for suppression or mop-up within riparian areas.

FM-12S Pumps and charged hoses shall not be back flushed into stream channels, wetlands, or surface water.

MA 4B Silviculture and Timber Management

TM-1S Silvicultural treatments shall occur in riparian management areas only as necessary to maintain, enhance, or restore desired conditions for aquatic and riparian resources. When conducted, these activities shall avoid or minimize adverse effects to aquatic and riparian resources. Vegetation in riparian management areas shall not be subject to regularly scheduled timber harvest because they are not part of the timber suitability landbase.

TM-2S Fuelwood cutting shall not be authorized in riparian management areas unless specifically designed to attain aquatic and riparian desired conditions.

TM-3G Use of existing or construction of new landings, designated skid trails, staging, and decking should not occur in riparian management areas, unless they are associated with projects designed to improve riparian management areas conditions. These features should:

- be of minimum size,
- be located outside the active floodplain, and

- avoid negative effects to large wood, bank integrity, temperature, and sediment levels.

TM-4G Yarding activities should achieve full suspension over the active channel; unless other alternatives will have less damage to riparian areas and stream channels.[23]

TM-5S Silvicultural practices shall include provisions, as appropriate, to avoid detrimental changes in water temperatures, blockages of water courses; including protection for streams, stream banks, shorelines, lakes, wetlands, and other bodies of water, and deposits of sediment.

TM-6S Silvicultural practices shall include provisions (e.g. Best Management Practices) for the maintenance or restoration of soil resources.

TM-7S Timber harvest on lands not suitable for timber production shall occur only to meet desired conditions for each management area other than timber production.

TM-8G In watersheds in which stream channels and aquatic habitats are in properly functioning condition, forest vegetation within riparian management areas should be managed to maintain or increase large wood recruitment and delivery to streams.

TM-9S In watersheds where stream channels and aquatic habitats are not in properly functioning condition, and where instream wood frequency and volume are below reference conditions and/or site potential, manage forest vegetation within riparian management areas to maintain or increase large wood recruitment and delivery to streams.

TM-10S As directed by the National Forest Management Act, timber harvest shall only occur when a site-specific finding has determined that it will not cause irreversible damage to soil, slope, or other watershed conditions.

MA 4B Livestock Grazing and Grazing Land Vegetation

GM-1S Manage livestock grazing to attain aquatic and riparian desired conditions. Where livestock grazing is found to prevent or retard attaining aquatic and riparian desired conditions, modify grazing practices (such as number of livestock, timing, and physical structures). If adjusting practices is not effective, remove livestock from that area using appropriate administrative authorities and procedures.

GM-2S New livestock handling and/or management facilities shall be located outside riparian management areas unless they do not prevent or retard attaining aquatic and riparian desired conditions.

GM-3G The purpose of this guideline is to manage livestock grazing to help attain and maintain aquatic and riparian desired conditions over time. Specifically, it is intended to maintain or improve vegetative and stream conditions, help ensure the viability of aquatic species, provide important contributions to the recovery of federally listed species, and facilitate attainment of State water quality standards.

The annual livestock use and disturbance indicators described below should be applied to help achieve, over longer timeframes, conditions at site and watershed

[23] Active channel is the bank full width of flowing perennial or intermittent streams.

scales that enable attainment and maintenance of desired conditions. The values specified below are starting points for management. Only those indicators and numeric values that are appropriate to the site and necessary for maintaining or moving towards desired conditions should be applied.[24] Specific indicators and indicator values should be prescribed and adjusted, if needed, in a manner that reflects existing and desired conditions and the natural potential of the specific geo-climatic, hydrologic and vegetative setting in which they are being applied.[25] Indicators and indicator values should be adapted over time based on long-term monitoring and evaluation of conditions and trends. Alternative use and disturbance indicators and values, including those in current Endangered Species Act consultation documents or non-Endangered Species Act allotment management plans or allotment National Environmental Policy Act decisions, may be used if they are based on best available science and monitoring data and meet the purpose of this guideline.

1. Where desired conditions for water quality, aquatic habitat, and riparian vegetation have been attained[26] and riparian vegetation is in late-seral conditions[27], protect or maintain those conditions by managing annual livestock grazing use and disturbance as follows [28]:

    - maintain a minimum of 4-inch residual stubble height [29] of key herbaceous species on the greenline;
    - utilize no more than 30-45 percent of deep-rooted herbaceous vegetation in the active floodplain[30] and, as needed, in other critical portions of the riparian management area;
    - limit streambank alteration[31] to no more than 20-25 percent; and

[24] Not all indicators may apply to a particular site. For example, stubble height is a meaningful indicator for lower gradient streams where herbaceous vegetation plays an important role in stabilizing streambanks. It is generally less useful for steeper channels, where channel morphology is controlled by coarse substrates. Moreover, not all numeric values may apply to a particular site (e.g., sites with short graminoids).

[25] Indicator values for specific sites should be determined based on consideration of local conditions including, but not limited to, the degree of departure between existing and desired conditions, the current and desired rate of improvement, site sensitivity to grazing, grazing season, the presence of special status species (e.g., federally listed species, Regional Forester’s sensitive species) that are sensitive to grazing, whether or not water quality standards and related requirements (e.g., total maximum daily loads for impaired waters) are being met, and the site’s importance in maintaining or attaining those standards and requirements. Consideration of these conditions is especially important in prescribing specific stubble height values within the 4-inch to 6-inch range and streambank alteration values within the 15-20% range.

[26] Assessment of conditions and trends should be based on best available information at a variety of spatial and temporal scales. Site-specific information is particularly important.

[27] Late seral conditions means the existing riparian vegetation community is similar to the potential natural community composition (per Winward 2000).

[28] Per PACFISH-INFISH Monitoring, Multiple Indicator Monitoring (BLM Technical Reference 1737-23) protocols or comparable methods for stubble height, streambank alteration, and use of woody species. Per Bureau of Land Management protocols (BLM/RS/ST-96/004+1730) or comparable methods for herbaceous utilization.

[29] Stubble height criteria apply at the end of the grazing period, when that period ends after the growing season. When the grazing period ends before the growing season does, stubble height criteria can be applied at the end of the grazing period or the end of the growing season.

[30] Active floodplain is defined as the area bordering a stream inundated by flows at a surface elevation that is two times the maximum bankfull depth (measured at the thalweg).

[31] Streambank alteration criteria apply within 1-2 weeks of removal of livestock from each pasture.

- limit use of woody species to no more than 30-40 percent of current year's leaders along streambanks and, as needed, in other critical portions of the riparian management area.

2. Where desired conditions for water quality, aquatic habitat, and/or riparian vegetation have not yet been attained, but conditions are moving towards those desired conditions,[26] enable continued recovery by managing annual livestock grazing use and disturbance as follows:

   - maintain a minimum of 4-inches to 6-inches residual stubble height of key herbaceous species on the greenline;[25]
   - follow the criteria for utilization of deep-rooted herbaceous vegetation, streambank alteration, and use of woody species described in (1).

3. Where desired conditions for water quality, aquatic habitat, and/or riparian vegetation have not been attained and conditions are not moving towards those desired conditions,[26] enable recovery by managing annual livestock grazing use and disturbance as follows:

   - maintain a minimum of 6-inches residual stubble height of key herbaceous species on the greenline;
   - utilize no more than 30-35 percent of deep-rooted herbaceous vegetation in the active floodplain and, as needed, in other critical portions of the riparian management area;
   - limit streambank alteration to no more than 15-20 percent,[25] and
   - limit use of woody species to no more than 20-30 percent of current year's leaders along streambanks and, as needed, in other critical portions of the riparian management area.

GM-4G During allotment management planning, existing livestock handling or management facilities that prevent or retard attaining aquatic and riparian desired conditions should be removed, as appropriate.

GM-5G Livestock trailing, watering, loading, and other handling in riparian management areas should be avoided or minimized.

GM-6S Livestock grazing shall be managed and implemented to avoid trampling federally listed threatened or endangered fish redds.

MA 4B Roads and Trails Management

RF-1G New roads and trails should not be constructed within riparian management areas unless no other feasible alternative exists.

RF-2G Temporary roads, including stream crossings, in riparian management areas should be minimized. Temporary roads, if constructed, should be managed to protect and restore aquatic and riparian desired conditions.

RF-3S Side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in riparian management areas shall be avoided.

RF-4S Fill material shall not be placed on organic debris in riparian management areas.

RF-5S Disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow shall be avoided when constructing or reconstructing roads or landings either inside or outside of riparian management areas.

RF-6G Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Minimize impacts where avoidance is not practical.

RF-7S New or replaced permanent stream crossings shall be designed to allow for the 100-year flood and its bedload and debris. 100-year flood estimates will reflect the best available science regarding potential effects of climate change.

RF-8S Where physically feasible, construction or reconstruction of stream crossings will avoid diversion of streamflow out of the channel and down the road in the event of crossing failure.

RF-9S Construction or reconstruction of stream crossings shall provide and maintain passage for all life stages of all native and desired nonnative aquatic and riparian-dependent organisms. Crossing designs shall reflect the best available science regarding potential effects of climate change on peak flows and low flows.

RF-10G Fish passage barriers should be retained where they serve to restrict access by undesirable nonnative species and are consistent with restoration of habitat for native species.

RF-11G Design roads to minimize delivery of water and sediment from roads to streams. Avoid or minimize disruption of hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when constructing, reconstructing, and maintenance of roads or landing.

RF-12G Road drainage should be routed away from potentially unstable channels, fills, and hillslopes to the extent practicable.

RF-13S Road maintenance and new road construction shall be designed to minimize adverse effects to threatened, endangered, proposed, or candidate aquatic species and their habitat.

MA 4B Recreation Management

RM-1G New facilities or infrastructure should not be placed within expected long-term channel migration zones if it has the potential to impact channel or floodplain function. If some facilities must occur in riparian management areas (such as road-stream crossings, boat ramps, docks, and interpretive trails), locate and design them to minimize impacts on floodplains and other riparian dependent resource conditions (e.g., within geologically stable areas, avoiding major spawning sites).

RM-2G Existing recreation facility components that are causing unacceptable[32] impacts in riparian management areas should be removed or relocated. Site condition should be restored to improve riparian area function.

[32] Conditions that are not meeting or trending towards desired conditions.

MA 4B Minerals Management

MM-1G For operations in riparian management areas, ensure operators take all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian dependent resources that may be affected by the operations. Ensure operations do not retard or prevent attaining aquatic and riparian desired conditions. Exceptions to this guideline include situations where Forest Service has limited discretional authorities. In those cases, project effects should be minimized and should not prevent or retard attaining aquatic and riparian desired conditions to the extent possible within those authorities.

MM-2G To the maximum extent possible, construct new structures, support facilities, and roads outside of riparian management areas. If new structures, support facilities and roads cannot be constructed outside riparian management areas because of site limitations, then construct and manage them to minimize adverse effects to aquatic and riparian dependent resources. Existing roads and facilities should be maintained to minimize damage to aquatic and riparian dependent resources, and should be removed/relocated if roads and facilities are causing unacceptable impacts in riparian management areas. When structures, support facilities, and roads are no longer required for mineral activities, they should be restored or reclaimed to achieve aquatic and riparian desired conditions.

MM-3S Mine waste with the potential to generate hazardous material (as defined by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)) shall not be authorized within riparian management areas and/or areas where groundwater contamination is possible. The exception is temporary staging of waste during abandoned mine cleanup.

MM-4G Mineral operations should minimize adverse effects to aquatic and riparian-dependent resources in riparian management areas. Require best management practices and other appropriate conservation measures to mitigate potential mine operation effects.

MM-5S Mineral activities on National Forest System lands shall avoid or minimize adverse effects to aquatic threatened or endangered species/populations or their designated critical habitat.

- All suction dredge mining activities in habitat for aquatic threatened or endangered species/populations or in their designated critical habitat shall be evaluated by the District Ranger to determine if the mining activity is causing or “will likely cause significant disturbance of surface resources.”[33] A likelihood that a threatened or endangered species "take" (defined in Section 3[18] of the Endangered Species Act of 1973 as amended) incidental to the mining activity is an example of a significant resource disturbance. Other significant disturbances that do not involve incidental take might involve effects on channel stability or stream hydraulics.

[33] The phrase “will likely cause significant disturbance of surface resources” means that, based on past experience, direct evidence, or sound scientific projection, the District Ranger reasonably expects that the proposed operations would result in impacts to National Forest System lands and resources which more probably than not need to be avoided or ameliorated by means such as reclamation, bonding, timing restrictions, and other mitigation measures to minimize adverse environmental impacts on National Forest System resources.

- If the District Ranger determines that placer mining operations are causing or will likely cause significant disturbance to surface resources, the District Ranger shall contact and inform the operator to seek voluntary compliance with 36 CFR 228 mining regulations and to cease operations until compliance.

MA 4B Uses and Hydropower

LH-1S Authorizations for all new and existing special uses, including, but not limited to water diversion or transmission facilities (e.g., pipelines and ditches), energy transmission lines, roads, hydroelectric, and other surface water development proposals, shall result in the re-establishment, restoration, or mitigation of habitat conditions and ecological processes identified as being essential for the maintenance or improvement of habitat conditions for fish, water and other riparian dependent species and resources. These processes include in-stream flow regimes, physical and biological connectivity, water quality, and integrity and complexity of riparian and aquatic habitat.

LH-2S New support facilities shall be located outside of riparian management areas. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, and transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation or enhancement measures.

LH-3G If existing support facilities are located within the riparian management areas, they should be operated and maintained to restore or enhance aquatic and riparian dependent resources. At time of permit re-issuance, consider removing support facilities, where practical.

MA 5 Developed Sites and Administrative Areas

MA5-1G Facilities should be maintained and protected to support management operations.

Part 4 – Monitoring and Evaluation Plan

Monitoring includes testing assumptions, tracking changes, and measuring management effectiveness and progress toward achieving or maintaining the Forest Plan's desired conditions or objectives. Monitoring information should enable managers to determine if a change in Plan components or other Plan content applicable to the Plan Area may be needed, forming the basis for continual improvement and adaptive management. Monitoring and evaluation will occur as the Forest Plan is implemented (i.e., following future site-specific actions).

Monitoring and evaluation are separate, sequential activities required by the National Forest Management Act. Monitoring is the collection of data by observation or measurement. Evaluation is the analysis and interpretation of monitoring data. The results of monitoring and evaluation may lead to changes in Forest Plan management direction.

There are three types of monitoring: (1) implementation, (2) effectiveness, and (3) validation.

- Implementation monitoring determines if the practices (i.e., plan components) we said we would do were implemented.
- Effectiveness monitoring determines how well a particular practice helps to achieve a project objective and helps to determine the rate at which desired conditions are being achieved.
- Validation monitoring tests key assumptions and generally involves designed research.

Two monitoring approaches, using implementation and effectiveness-type monitoring actions, are used for monitoring the Plan Area to determine whether the land management plan needs to be changed.

1. The Plan monitoring program identifies the monitoring questions and associated indicators for monitoring the Plan. The Plan monitoring program consists of a set of monitoring questions and associated indicators to evaluate whether plan components are effective and appropriate and whether management is effective in maintaining or achieving progress toward desired conditions and objectives for the Plan Area.
2. Broader-scale monitoring information is used to address relevant Plan monitoring questions that are best answered at a larger geographic scale. The Regional Forester is responsible for developing a broader-scale monitoring strategy (FSH 1909.12 sec. 33) to answer and manage Plan monitoring questions common to two or more Plan Areas in the Region. Broader-scale monitoring strategies may be comprised of questions and indicators or may also include a description of protocols, data management, responsibilities, and partnerships for the questions and indicators. An example of broad-scale monitoring may include the PACFISH-INFISH Biological Opinion Effectiveness Monitoring program which addresses the condition of aquatic and riparian communities within the range of steelhead and bull trout.

The Forest Plan monitoring program will be coordinated and integrated with broader-scale monitoring strategies to ensure that monitoring is complementary and efficient, and that information is gathered at scales appropriate to the monitoring questions (36 CFR 219.12).

Biennial monitoring evaluation reports will document whether a change to the Forest Plan or change to the monitoring program is warranted based on new information, whether a new assessment may be needed, or whether there is no need for change at that time (36 CFR 219.12). The monitoring evaluation report will summarize Plan monitoring results and will incorporate

broad-scale monitoring information to answer the relevant monitoring and evaluation questions. The monitoring evaluation report is intended to inform adaptive management for the Plan Area. The monitoring evaluation report will be made available to the public. Table 38 through Table 45 display the Plan monitoring framework including monitoring questions, indicators, and Plan components to be monitored. Both Plan-specific monitoring and broader-scale monitoring actions are identified in Table 38 through Table 45.

Table 38. Monitoring plan framework: 1. Status of select watershed conditions. Key ecosystem characteristics related to water resources and watershed conditions, such as water quality, quantity, timing and distribution provide the basis for monitoring watershed conditions.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
What is the status and trend of water quality?	Miles of state-listed impaired waters	State 303d-list	5 years	Effectiveness	Moderate	L, S, C	1.11 Water Quality
What is the status and trend of stream temperature?	Stream temperature	NRIS-Aquatic Surveys temperature data, other agency databases, RMRS stream temperature models	Annual status, 5 years for trend	Effectiveness	Moderate	L, S, C	WM-2S
What is the status and trend of stream flows?	Streamflow	Federal and state agency databases and Forest Service databases	Annual status, 10 years for trend	Effectiveness	Moderate	S, C	1.1.1 Hydrologic Function
Are watershed/aquatics standards and guidelines and best management practices being implemented at project sites (e.g., range, roads, recreation, and vegetation management)?	Multiple	Project files, field observations	Annual for status, 5 years for trend	Implementation, Effectiveness	High	L, S, C	1.1 Watershed Function
Are watershed/aquatics standards and guidelines and best management practices effective at achieving desired on-site conditions at project sites (e.g., range, roads, recreation, and vegetation management)?	Multiple	Field observations	Annual, 5 years	Effectiveness	Moderate	L, S, C	1.1 Watershed Function

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
What is the status and trend of watershed condition in all watersheds and in key watersheds?	Multiple watershed condition indicators and attributes	Forest Service and other agency databases (WCF)	3-5 years for grazing-related parameters, 5 years for full WCF status updates.	Effectiveness	Moderate	S, C	1.1 Watershed Function
What is the status and trend of riparian vegetation condition?	Condition and trend of riparian vegetation, PIBO parameters	PIBO and forest datasets	5 years	Effectiveness	Moderate	L, S, C	1.1.2 Riparian Function
What is the change in the distribution of known sites for selected aquatic and riparian invasive species?	Presence of selected invasive species	Federal and state agency databases and Forest Service databases	Annual, 5 years	Implementation	High	S, C	1.5 Invasive Species
What is the status and trend of aquatic habitat?	Miles of stream habitat improved, PIBO parameters	Forest Service databases, PIBO datasets	Annual, 5 years	Implementation	Moderate	L, S, C	1.1.5 Aquatic Habitat Function
What is the status and trend of aquatic habitat connectivity and accessibility for aquatic species?	Miles of aquatic habitat with improved access for surrogate species	Forest Service databases	Annual, 5 years	Implementation	High	L, S, C	1.1.5 Aquatic Habitat Function

NRIS = Natural Resource Information System, PIBO = PACFISH/INFISH Biological Opinion, RMRS = Rocky Mountain Research Station, WCF = Watershed Condition Framework

Table 39. Monitoring plan framework: 2. Status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
Have lands been adequately restocked within five years of regeneration harvest?	Stocking	FACTS	5 years, 5 years	Implementation	High	L	MA4A-1S
Have lands that are not suitable for timber production become suitable?	Forest extent	CVS, GIS	5 years, 5 years	Implementation	Moderate	L	3.3.1 Forest Products
What is the maximum size opening from even-aged management?	Opening sizes	FACTS	5 years, 5 years	Implementation	Moderate	L	FP-1S
What are the trends in fire regime condition class?	Acres by fire regime condition class (FRCC)	CVS (FIA) vegetation databases, remote sensing	Annual, 5 years	Implementation	Moderate	S	1.4.1 Wildland Fire
What are the trends in insect and disease hazard?	Forest level hazard of tree mortality due to insects and diseases	National Insect and Disease Risk Map Assessment	6 years	Effectiveness	Moderate	S	1.4.2 Insects and Diseases
What are the trends in stand density?	Acres of low density forest by potential vegetation group (PVG)	CVS (FIA), FSVEG Spatial	5 years, 5 years	Implementation	High	S	1.8 Stand Density
What are the trends in stand density?	Acres of stand density reduction treatment	FACTS	Annual, 5 years	Implementation	High	S	1.8 Stand Density
What are the trends in the introduction, establishment, and spread of invasive plants?	Acres infested/acres treated	NRIS, FACTS	Annual, 5 years	Implementation, effectiveness	Moderate	L	1.5 Invasive Species
What are the trends in early seral tree species (ponderosa pine and western larch) composition?	Acres with desired species composition	CVS (FIA), FSVEG Spatial	5 years, 5 years	Implementation, effectiveness	Moderate	S	1.7 Plant Species Composition
What is the success of post-fire revegetation efforts where droughty/mollisol soils occur?	Acres where revegetation efforts in droughty/ mollisol soils was not successful	NRIS, FACTS	5 years, 10 years	Effectiveness	Moderate	S	1.8 Stand Density

CVS = common vegetation survey, FACTS = Forest Service ACtivities Tracking System, FIA = Forest Inventory and Analysis, FSVEG = field sampled vegetation, GIS = geographic information system, NRIS = Natural Resource Information System

Table 40. Monitoring plan framework: 3. Status of select set of the ecological conditions required under §219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each surrogate species.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
What is the condition and trend in habitats for aquatic surrogate species (steelhead, spring Chinook salmon, bull trout, and redband trout)? (Designated Critical Habitats coincide with habitats for steelhead, spring chinook salmon and bull trout in subbasins occupied by listed populations).	See Status and Trend-Aquatic habitat, Status and Trend- Aquatic Habitat Connectivity	Forest Service databases, PIBO datasets	Annual, 5 years	Implementation, Effectiveness	Moderate	L, S, C	1.2 Species Diversity
What are the trends in whitebark pine survival and recruitment?	Whitebark pine survival and recruitment	Whitebark pine transects and plots	5 years, 5 years	NA	Moderate	S	1.13 Special Plant Habitats
What are the trends in source habitat and risk factors for Cassin's finch?	Changes due to management or disturbance events	Accomplishment reports, FACTS, Fire GIS layer	2 years, 2 years (5 years for Alternatives B, C, and F)	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What are the trends in source habitat and risk factors for boreal owl, western bluebird, and fox sparrow?	Changes due to management or disturbance events	Accomplishment reports, FACTS, Fire GIS layer, open route density (boreal owl and western bluebird only)	2 years, 5 years	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What are the trends in source habitat for bighorn sheep?	Changes due to management or disturbance events	FSVEG Spatial	5 years	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What are the risk factors for bighorn sheep?	Pathogens from domestic livestock, invasive plants	Range suitability	Annual, 5 years	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What are the population trends for bighorn sheep?	Population data, herd composition	ODFW and WDFW data/ surveys	Annual	Implementation, effectiveness	High	S	1.2 Species Diversity

FACTS = Forest Service ACtivities Tracking System, FSVEG = field sampled vegetation, GIS = geographic information system, ODFW = Oregon Department of Fish & Wildlife, PIBO = PACFISH/INFISH Biological Opinion, WDFW = Washington Department of Fish & Wildlife

Table 41. Monitoring plan framework: 4. Status of focal species to assess the ecological conditions required under§ 219.9.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
What are the population trends and/or habitat trends of Pileated woodpeckers?	Regional Protocol	See regional protocols	5 years	Implementation, effectiveness	Moderate	L	1.2 Species Diversity
What are the population trends and/or habitat trends of white-headed woodpeckers?	Regional Protocol	See regional protocols	5 years	Implementation, effectiveness	Moderate	L	1.2 Species Diversity
What are the population trends and/or habitat trends of mule deer? (MAL only)	Population data/ security acres	ODFW data/surveys/ FACTS	Annual, 5 years	Implementation, effectiveness	Moderate	L, S	1.2 Species Diversity
What are the population and habitat trends/distribution of Rocky Mountain elk?	State population and distribution data/security acres/distance from open routes	ODFW and WDFW data/surveys/ FACTS	Annual, 5 years	Implementation, effectiveness	Moderate	L, S	1.2 Species Diversity, 2.3.1 Rocky Mountain Elk
What are the population trends and/or habitat trends of Rocky Mountain elk?	Acres greater than 0.5 miles from open routes/acres of security habitat	State population and distribution data/distance from open routes/FACTS	5 years, 5 years	Implementation, effectiveness	Moderate	L, S	1.2 Species Diversity

FACTS = Forest Service ACtivities Tracking System, ODFW = Oregon Department of Fish & Wildlife, WDFW = Washington Department of Fish & Wildlife

Table 42. Monitoring plan framework: 5. Status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
Is recreation user satisfaction maintained or improved over time?	Visitor use	National Visitor Use Monitoring Data or similar national monitoring protocol	5 years	Effectiveness	High	S	2.2 Recreation
Are recreation facilities properly maintained and meet all health, safety and accessibility requirements?	Recreation facility condition	National Visitor Use Monitoring Data or similar national monitoring protocol	5 years	Effectiveness	High	S	2.2 Recreation

Table 43. Monitoring plan framework: 6. Measurable changes on other Plan Area related to climate change and other stressors that may be affecting the Plan Area.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
Does new scientific information related to climate change indicate a need to change plan components?	New scientific findings	Best available scientific information	5 years	Effectiveness	Low	S	1.2 Species Diversity, 2.9 Community Resilience

Table 44. Monitoring plan framework: 7. Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
Are watershed/aquatic restoration projects (e.g., road decommissioning, passage improvements, riparian stream habitat improvements, etc.) being implemented at a rate consistent with Forest Plan objectives?	Annual accomplishment metrics (e.g., road miles decommissioned)	Forest Service databases	Annual	Implementation	High	S, C	1.1 Watershed Function
Are structural stages trending towards the desired range of variation?	Structural stage distribution by PVG	CVS (FIA), FSVEG Spatial	Annual, 5 years	Implementation, effectiveness	Moderate	S	1.6 Structural Stages
Are trends in percent of herblands and shrublands making progress towards achieving the desired condition?	CVS plots	CVS (FIA)	5 years, 5 years	Implementation, effectiveness	High	S	1.6 Structural Stages
Are acres restored using wildfire consistent with levels expected in the Forest Plan?	Acres of restoration from wildfire	FACTS	Annual, 5 years	Implementation	Moderate	S	1.4.1 Wildland Fire
Is the mix of wildfire severity and frequency within the range of variability shown in Table 5?	Wildfire severity and frequency	Remote sensing data	Annual, 5 years	Implementation	Moderate	S	1.4.1 Wildland Fire
Are roads and trails being maintained at the appropriate level?	Miles of maintenance level changes	GIS, INFRA, MVUM	Annual, 5 years	Implementation	High	S	2.5 Roads and Trails Access
Are outputs of goods and services being produced consistent with the levels expected in the Forest Plan?	Acres of fuels reduction treatments, cubic feet of timber harvest, AUMs	FACTS, TIM, NRM INFRA	Annual, 5 years	Implementation	High	L	3.3 Goods and Services
Are actual costs per acre of implementation treatments within 20% of Forest Plan estimates?	Cost per acre of restoration and fuel reduction treatments	FACTS	5 years	Implementation	Moderate	L	N/A

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
Are destructive insects and disease organisms increasing to potentially damaging levels following management activities?	New insect and disease activity in recently treated areas	Aerial Insect and Disease detection surveys; FSVEG Spatial; CVS Plots	Annual, 5 Years	Implementation	Moderate	L	1.4.2 Insects and Diseases

AUM = animal unit months, CVS = common vegetation survey, FACTS = Forest Service ACtivities Tracking System, FIA = Forest Inventory and Analysis, FSVEG = field sampled vegetation, GIS = geographic information system, INFRA = Infrastructure, MVUM = Motor Vehicle Use Map, NRM = Natural Resource Manager, TIM = Timber Information Manager

Table 45. Monitoring plan framework: 8. The effects of each management system to determine that they do not substantially and permanently impact the productivity of the lands (16 U.S.C. 1604(g)(3)(C). Focus on key ecosystem characteristics in the Plan Area related to soils and soil productivity identified in the assessment and planning process.

Proposed Monitoring Question	Parameter	Related Program Indicators	Monitoring and Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal Requirement; S: strategic; C: consultation	Plan Component
Are projects being designed and implemented to result in no more than 20% detrimental soil disturbance at project conclusion?	Percent of detrimental soil disturbance after project conclusion	Project files, field observations (such as Forest Soil Disturbance Monitoring Protocol, GTR WO-82a)	Annual, 5 years	Implementation	Moderate	L, S, C	1.10 Soil Quality

Summary of the Analysis of the Management Situation

Introduction

This section summarizes the analysis of the management situation produced in 2005 for the Malheur, Umatilla, and Wallowa-Whitman National Forests, including the portion of the Ochoco National Forest administered by the Malheur, collectively referred to as the national forests of the Blue Mountains. The analysis of the management situation provides a determination of the ability of the Plan Area to supply goods and services in response to society's demands. The primary purpose of this analysis is to provide a basis for formulating a broad range of reasonable alternatives. Required elements of the analysis of the management situation include:

- Benchmark analysis (defines the range within which the alternatives can be constructed)
- The current level of goods and services provided by the unit
- Projections of demand for goods and services
- Determination of the potential to resolve public issues and management concerns
- Determination of the need to establish or change management direction

Benchmark Analysis

The development of benchmarks is required as a provision of 1982 Planning Rule, sec 219.12 (e.1). During the need for change evaluation, all benchmarks were reviewed and evaluated. The nontimber benchmarks, including wildlife, wilderness areas, and range, were determined to be appropriate and reasonable, therefore no new ones were developed. Following the need for change evaluation, five new timber benchmarks were developed:

1. Minimum level (219.12 (e)(1)(i))
2. Maximum biological potential (219.12 (e)(1)(ii) (C) with departure from the base schedule
    a. Maximum biological potential (219.12 (e)(1)(ii) meeting the base schedule
3. Maximum present net value (219.12 (e)(1)(iii) (C) with departure from the base schedule
    a. Maximum present net value (219.12 (e)(1)(iii) meeting the base schedule

Summary of Projected Timber Benchmark Annual Outputs (millions of board feet)

Table 46 shows that benchmarks 2 and 2a would produce the greatest long-term sustained yield (LTSY) because they would have more timber production acres than benchmarks 3 and 3a. Benchmark 2 would produce the greatest first decade level of volume as the allowable sale quantity (ASQ). The high first decade harvest rates in benchmarks 2 and 3 attempted to reduce the high level of available over-stocked stands more quickly than benchmark 2a or 3a. The first

decade volume for benchmark 2A and 3A are lower than benchmarks 2 and 3 because they level out the flow of volume so that each subsequent decade volume is greater than or equal to the previous decade volume (nondeclining flow).

Table 46. Projected benchmark timber outputs (MMBF)

Benchmark	MAL LTSY	MAL ASQ	UMA LTSY	UMA ASQ	WAW LTSY	WAW ASQ
1	0	0	0	0	0	0
2	126	123	80	79	134	99
2a	126	86	80	40	134	55
3	112	107	71	57	114	83
3a	112	79	71	34	114	43

MAL = Malheur, UMA = Umatilla, WAW = Wallowa-Whitman

Summary of Wildlife, Fish and Grazing Benchmarks (from 1990 forest plans)

The nontimber benchmarks from the 1990 Plans, including wildlife, fish, and range, were reviewed and found to be appropriate and reasonable; and therefore, no new ones were developed. These existing benchmarks provide a basis for developing a reasonable range of alternatives. Table 47 displays the 1990 benchmarks for livestock, big game, and fish.

Table 47. Maximum yearly benchmark outputs from 1990 Forest Plans summary of the analysis of the management situation

National Forest	Livestock Grazing (thousand AUMs)	Big Game Use (thousand user days)	Fish Production (thousand pounds per year)
Malheur	194	168 (WFUDs)	43
Umatilla	103	580 (WUDs)	28 (RVDs), no estimate of pounds but 1.7 million smolts produced per year
Wallowa-Whitman	227	6,957 (WFUDs)	221

AUM= animal unit month, RVD= anadromous fish use days, WFUD= wildlife and fish user days, WUD= wildlife user days

Current Level of Goods and Services Provided by the Unit

The following section describes the current social, ecological, and economic conditions based on the analysis of the management situation produced in 2005. The section provides a brief summary of existing conditions and serves as an overview of select resources managed by the national forests of the Blue Mountains region. Four subsections for individual resource areas are presented within the summary report and include the status of desired future conditions and objectives; current conditions and trends; major changes since 1990; and areas of concern. The information presented below was developed under the “current conditions and trends” subsection and provides detail and trends that 1) have influenced whether the 1990 stated desired conditions were achieved and/or 2) may influence the ability or desire to continue working toward the same desired conditions. Table 48 through Table 52 display current levels of goods and services for several selected resources.

Timber

Current levels of acres of silvicultural treatment and volume of timber harvested have greatly decreased from projected levels in the current Forest Plans. Harvest methods have shifted from even-age management to uneven age methods. National policy direction, as well as increasing experience in applying ecosystem management, has substantially reduced the number of harvested acres. The trend for acres accomplished for reforestation and precommercial thinning is also declining. Acres of precommercial thinning needed to create a more resilient condition are rapidly increasing beyond the ability to accomplish considering current or anticipated budgets.

Table 48 Timber sale program quantity sold (excluding firewood or permit sales)

National Forest	Average per year FY2013-2015 (million board feet)
Malheur	52
Umatilla	26
Wallowa-Whitman	23

Range

Most of the southern end of the Blue Mountains (Malheur and southern Wallowa-Whitman National Forests) as well as the far north end (Wallowa Valley Ranger District), were characterized by the Interior Columbia Basin Ecosystem Management Project (ICBEMP) as having between 70-100 percent low range and ecological composite integrity (USDA 1996). Forage conditions have been reduced by woodland juniper encroachment and expansion of invasive weed species. A decline in herb lands and shrub lands was observed. Much of the area was characterized as sensitive to overgrazing and invasive plants. Most of the Umatilla National Forest and the western portion of the Wallowa-Whitman National Forest (La Grande and Baker Ranger Districts) were modeled by ICBEMP as having 76 percent low range integrity and 58 percent low ecological integrity, with existing conditions that have been highly altered from historic conditions by livestock grazing, timber harvest, and exclusion of fire. Historic high levels of grazing combined with possible climate shifts and fire suppression may have created conditions favorable to the establishment of large numbers of tree seedlings.

Table 49. Animal unit months (AUMs) per year (2013)

National Forest	AUMs (thousand)
Malheur	132
Umatilla	49
Wallowa-Whitman	112

Water and Soils

According to scientific assessments in the Interior Columbia Basin Ecosystem Management Project, riparian systems in several Blue Mountains watersheds have declined from their historic extent and condition. The Interior Columbia Basin study noted a decline in riparian shrub communities in the Blue Mountains of up to 70 percent since the 1930s resulting from impacts of agricultural development, roads, grazing, logging, water development, and other human uses.

As of 2018, the only basins in the Blue Mountains for which total maximum daily load assessments (TMDL) have not been completed are the Powder (Powder, Burnt, and Brownlee

sub-basins) and the Oregon Closed basins (Silvies, Silver, and Harney-Malheur lakes sub-basins). The Powder sub-basin TMDL is in progress.

Special Habitats

A wide variety of special habitats occur across the Blue Mountains. Some of these habitats were officially designated as Management Areas as part of the original planning process. Other, undesignated habitats (such as cliffs, talus slopes, and wet areas) are considered unique and receive certain protections.

Riparian areas are also considered to be special habitats. Riparian areas across the Blue Mountains, as well as all other national forests within the Columbia River Basin, are afforded protection through interim management direction referred to as PACFISH and INFISH. Additional protection measures may have resulted from project-specific Endangered Species Act consultations. The interpretation of habitat protection provided by PACFISH and INFISH varies between the three National Forests. In addition to providing habitat for fish populations, riparian areas also serve as travel corridors between old growth units for big game species.

Wildfire/Prescribed Fire

Acres burned by wildfire in the Blue Mountains have increased over the last 20 years when compared to totals prior to 1980. High severity wildfires within the warm, dry forest types have increased in both extent and severity when compared to estimated historic levels.

The use of fire managed for resource benefit has only occurred in a limited number of situations in wilderness areas across the three National Forests. Acres of natural fuel treatments are increasing. Acres of activity-related fuel treatment are decreasing and related to decreased timber harvest.

Recreation

National forests in the Blue Mountains provide a variety of recreation opportunities from highly developed downhill skiing facilities to remote wilderness. The recreation resources are described and managed in terms of recreation opportunities, using the recreation opportunity spectrum. The recreation opportunity spectrum inventory identified five physical/social settings on the three forests (see Table 50). Within the recreation opportunity spectrum settings, the national forests provide two principle types of recreation: developed recreation sites, in which activities are dependent on constructed facilities (such as recreational vehicle camping, downhill skiing, and recreation residences); and dispersed recreation, where the activities are not dependent on constructed facilities (such as hunting, fishing, and off-highway vehicle use).

Table 50. Acres of National Forest System lands in each recreation opportunity spectrum class

National Forest	Primitive	Semi-primitive Nonmotorized	Semi-Primitive Motorized	Roaded Natural	Roaded Modified	Rural
Malheur*	81,300	45,600	140,100	748,100	444,400	0
Umatilla	36,000	269,000	6,000	119,000	972,000	0
Wallowa-Whitman	590,815	269,000	260,200	985,600	242,100	1,500

* may not include Emigrant Creek Ranger District lands formerly administered by the Ochoco National Forest.

Developed Recreation Sites

Facility infrastructure continues to have a backlog of deferred maintenance needs. Sites are slowly coming into conformance with Americans with Disabilities Act standards. Capital improvement projects have upgraded some high use sites and agreements with other recreation providers and volunteer groups have resulted in improved sites at many locations.

The Oregon State Comprehensive Outdoor Recreation Plan (State of Oregon 2003) survey specifically identified two major developed facility-related issues in this planning region of Oregon. Funding priorities established in the report were for major rehabilitation of outdoor recreation facilities (paving, off-highway vehicle areas, watchable wildlife areas, and accessibility), and for winter recreation facilities (snow parks, snowmobile parking, trail shelters, and winter recreational vehicle parking).

The October 2002 Assessment of Outdoor Recreation in Washington State (Eychaner 2002) reported that a growing demand is resulting in more reported crowding, increased specialization, increased user conflicts, and increased management actions to limit adverse impacts to access and activities.

The top five most popular activities across the Blue Mountains involve developed facilities according to the 2003 National Visitor Use Monitoring surveys. Developed campgrounds and picnic areas remain popular, as are developed fishing sites. In some of the developed sites, a few visitors had the overall impression that the site was crowded, but it was not a prevailing issue with those surveyed. The demographic results from the National Visitor Use Monitoring surveys indicate that the “average visitor” to the Blue Mountains national forests is: male (77 percent), between 41 and 60 years old (45 percent), and white (97 percent). The vast majority of visitors come from counties contiguous to the national forest boundaries, about 38 percent of them stay overnight on the national forests, and the average length of their stay is 31 hours. The national forests serve as “backyards” to moderate population areas for activities that are not often available in the private sector (viewing scenery and wildlife, developed and primitive camping, hiking, and walking).

Dispersed Camping

In the current Forest Plans, uses allowed within the Management Area guidelines are specific to the intensity of development within the Management Area itself. Summer and winter motorized use is increasing. Winter activity takes place largely on trail systems. The off-highway vehicle section below also discusses this growing segment of recreation use.

The national forests are the primary provider nationwide of dispersed recreation opportunities (National Survey on Recreation and the Environment 1999-2002 (USDA 2003)). Potential activities that take place on national forest lands (that have not been previously discussed) where the Forest Service is most likely the “primary provider” include: rustic motorized and nonmotorized camping, hunting, viewing scenery and wildlife, nature study, orienteering, geocaching, “hanging out and relaxing,” fishing, gathering forest products, hang gliding, parasailing and paragliding, and target shooting.

Nature and natural settings play an important role in many activities by category and type. There is a high participation in observing and photographing the outdoors, especially wildlife, as well as continued participation in nature-dependent activities like hunting and fishing, all of which indicate the importance of preserving habitat for fish and wildlife.

Off-Highway Vehicle Use

Since 1989, off-highway vehicle use of national forests has changed dramatically. This overall increased use is also occurring across the Blue Mountains. Factors such as an increase in recreationists with more disposable income, advanced technologies and abilities for off-highway vehicles, and an aging population, has led to an increase in use. However, not all off-highway vehicle users are pursuing recreational activities, and use is not limited to roads and trails. The traditional high use periods of mid-summer and early fall have also been expanded due to increased hunting seasons and riders using the machines for new activities. Some general user categories and uses are:

Variety of Users:

- Hunters – estimated to be more than 75 percent of tri-forest users
- Trail and road riders – families, individuals, and small groups.
- Cross-country users – explorers, antler hunters, and mushroom pickers
- Forest Service permittees and adjacent landowners
- Organized clubs and events riders
- State and federal administrative use
- Extreme riders – less than 1 percent

Variety of Uses:

- Cross-country travel – exploring, retrieving game, hunting sheds, and picking berries
- Long distance routes – long day loops
- Family recreation – short rides and loops; “tot lots” and play areas.
- Personal challenges – hill climbing, rugged terrain, variety and difficulty of trails.
- Permit related – fence maintenance, utility corridor inspection, Forest Service surveys and monitoring
- Adjacent property and home related use – short trips to visit neighbors, or going to local markets.

Variety of Seasons:

- Spring - Winter: hunting
- Summer: vacation and leisure-time use
- Year-round: local resident use

Wilderness Areas (Existing and Potential)

The table below shows the amount and distribution of existing wilderness areas across the Blue Mountains national forests. According to the 2001 Forest Plan Monitoring and Evaluation Report (USDA 2002), most of the monitoring has been field observations. On the Malheur National Forest, “violations of wilderness rules and regulations were minimal, the pristine area maintained its character, the primitive area retained its characteristics and met the management objectives” for both Monument Rock and Strawberry Mountain Wilderness Areas (USDA 2002). The Umatilla National Forest reports state that “…the amount of nonconforming use is at a low enough level that wilderness values are not being damaged.” Wilderness standards are being met for the Wenaha-Tucannon, North Fork John Day, and North Fork Umatilla Wilderness Areas on the Umatilla National Forest. For the Wallowa-Whitman National Forest, monitoring for the Eagle Cap and Hells Canyon Wilderness Areas was inconclusive for determining if the wilderness is being managed according to management direction and provisions of the Wilderness Act. Minimum maintenance is done on trails within the Baldy Creek unit of the North Fork John Day

Wilderness, and nonconforming uses include all-terrain vehicles and mountain bike encroachment. Within the Wallowa-Whitman portion of the Monument Rock Wilderness, all of the trails were maintained; however, Forest Service presence was minimal during the visitor use season.

Table 51. Designated wilderness areas by national forest

National Forest	Acres of Wilderness Areas (percent of national forest)
Malheur	81,970 (2%)
Umatilla	304,925 (22%)
Wallowa-Whitman*	585,781 (24%)
Total	**972,676 (18%)**

* Includes designated Wilderness in the Hells Canyon National Recreation Area.

Table 52 Potential wilderness areas by national forest in the Blue Mountains

National Forest	National Forest (acres)	Number of Potential Wilderness Areas	Potential Wilderness Areas (acres)	Percent National Forest
Malheur	1,708,960	16	149,590	9%
Umatilla	1,403,920	24	297,240	21%
Wallowa-Whitman*	2,405,180	35	258,480	11%
Total	5,518,060	75	705,310	13%

* Includes potential wilderness in the Hells Canyon National Recreation Area

Projections of Demand for Goods and Services

Timber

The timber supply and demand situation has changed dramatically during the past few decades. Since the early 1990s, Oregon counties in the Blue Mountains analysis area have experienced significant declines in timber harvest due to federal management changes intended to protect wildlife species and encourage the growth of older forests. These declines resulted in reduced timber volumes sold from the Malheur, Umatilla and Wallowa-Whitman National Forests of the Blue Mountains area. Timber volume sold from these national forests in recent years has increased some, but has declined dramatically, from a high of almost 600 million board feet during the early 1990s to about 100 million board feet today.

Numerous primary wood processing plants have closed since the 1980s in the Blue Mountains region. For example, according to Ehinger (2012), 30 sawmills, 4 plywood plants, 3 veneer plants and 2 composite panel plants have closed since 1990 in the 17 Oregon counties east of the Cascade Crest. This has reduced log demand by about 1 billion board feet and resulted in the loss of about 3,800 direct manufacturing jobs.

Depending on supply and prices, demand for logs and fiber from the Blue Mountains region also involves at least 23 facilities outside of Eastern Oregon proper. These include 12 pulp/paper mills, most of them located along the Columbia or Snake Rivers, a charcoal briquette plant in Springfield, and 4 biomass energy producers (White City, Roseburg, Eugene and Lyons). Other non-Eastern Oregon purchasers include a post/pole operation in Idaho and a major firewood dealer in Lyons. Sawlogs are shipped at times to a reload facility in White City from Eastern

Oregon, and sawlogs and chips are trucked directly to two export facilities in Coos Bay on the coast as supply and market prices allow. A densified wood fuel plant in Cascade Locks (i.e., wood pellets and "bricks") purchases fiber on occasion from Eastern Oregon, but only Douglas-fir processing residuals (i.e., sawdust and shavings) (Swan et al. 2012).

The timber industry surrounding the national forests in the Blue Mountains has undergone significant declines in the past few decades. Solid-wood product prices will slightly rise, whereas, prices for paper and paperboard are expected to decline in real terms. These national level reports point to relatively stable supply-demand conditions. While this may be true nationally, it creates a problem locally. The stable end-product or output prices may mean that without advancements in wood processing technology, log prices may remain low and not induce investments for local log supply or increased imports. Without a sufficient and reliable supply of logs, it is likely there will be continued reductions in wood product processing capacity.

Range

Livestock grazing on the national forests in the Blue Mountains is an important use to the local ranching industry. Grazing on public lands contributes directly to livestock forage needs. In 2012, the counties in the Oregon portion of the plan revision area had about 40 percent of the total cattle and 18 percent of the total sheep inventory of the State (USDA National Agriculture Statistics Service). Grazing on national forest lands directly provided about three percent of the forage needs of the local cattle inventory. The total contribution of national forest grazing is likely greater since ranchers have the opportunity to grow forage on other ranch lands for feed.

Total annual forage production is estimated to be 600 million pounds on the Malheur, 350 million on the Umatilla, and 650 million pounds on the Wallowa-Whitman National Forest.

The demand for forage from National Forest System lands is affected by the price that permittees have to pay for that forage. As long as that price approximates the appraised market value for that forage, the demand will remain high.

Wilderness

The following factors were summarized from the Blue Mountains wilderness need evaluation.

Use, Visitors, and Changing Patterns of Use

Currently, use of the Blue Mountains wilderness areas account for only a small part (8 percent) of the overall use on the Blue Mountains and even a smaller proportion (4 percent) of the use of national forest lands in the general vicinity. Use trend data suggests that aging populations and shifts in the type of activities younger people are interested in will result in a 2 to 8 percent increase in demand for activities over the next 15 years. This increase will primarily be in day use from nonwilderness areas. Current wilderness areas in the Blue Mountains reach capacity only in specific areas during brief high use periods.

Opportunities for Unconfined Outdoor Recreation Experiences

The Blue Mountains provide high potential opportunities for unconfined recreation experiences and solitude both regionally and locally. The social demand for unconfined experiences is related to general dispersed settings; it is not just specifically wilderness areas that provide both motorized and nonmotorized activities. Management direction in the Forest Plan will maintain many undeveloped areas where natural ecosystem processes predominate in both wilderness and nonwilderness settings.

Capacity of Designated Wilderness Areas to Support Human Use

Although there is a desire by some public for more wilderness areas across the Blue Mountains, there is not a social need to designate additional wilderness because the current wilderness areas are not exceeding capacity, except in site-specific locations on limited occasions. Alternative sites exist within and adjacent to these areas and within other wilderness areas in the Blue Mountains to accommodate visitor responses to these instances. Based on current uses, trends, primary market zones, demographic changes, crowding levels, visitor pressures, projected uses, existing opportunities for unconfined recreation, and social values, wilderness use is unlikely to exceed the capacity of the existing wilderness areas and is not likely to result in a need for more wilderness in the next 15 years.

Determination of the Potential to Resolve Public Issues and Management Concerns

The Forest Plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests share many common issues and resource similarities. The Forest Service established one team, the Blue Mountains Forest Plan Revision Team, to revise the Forest Plan for the three national forests. There are several reasons for this collaboration:

- All three forest plans were approved in 1990;
- They share key issues, resources, customers, and interested entities; and
- Forest managers desire similar management across administrative boundaries.

Since June 2004, the Blue Mountains Revision Team has been working collaboratively with local communities to:

- Develop a vision for the future management of the national forests in the Blue Mountains,
- Create building blocks that will be used in the Revised Forest Plan,
- Identify what is not working in the 1990 Forest Plans, and
- Craft revision proposals.

The Blue Mountains Revision Team worked with State and county governments, Tribes, and resource advisory groups as co-conveners using the collaborative process. These groups have broad networks of contacts with expertise in land management planning, and have demonstrated that they can build partnerships, resolve conflicts, and find resolutions to existing problems, as well as to design mitigations for issues that could occur in the future.

Determination of the Need to Establish or Change Management Direction

Legal Requirement

The existing Forest Plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests are more than 20 years old. The National Forest Management Act of 1976 requires each national forest to revise its land and resource management plan every 10 to 15 years. Since 1990, economic, social, and ecological conditions have changed; new laws, regulations and policies are in place; and new information based on monitoring and scientific research is available. The Malheur National Forest Plan was signed May 25, 1990 and has been amended 82 times since

that date. The Umatilla National Forest Plan was signed June 11, 1990 and has been amended 34 times since that date. The Wallowa-Whitman National Forest Plan was signed April 23, 1990 and has been amended 52 times since that date.

The analysis of the management situation that was developed in 2005 noted that forest plans are based on the concept of “Need for Change,” and provided several subsections that identified initial needs for change.

Provincial Consistency

The three forests share key issues, resources, customers, and interested publics. The three national forests need to work together to consider management of ecosystems across administrative boundaries and develop a more consistent management program. By working together and sharing personnel, services, budget, and experience, the overall efficiency and quality of the revision effort is expected to increase.

Appropriate blending of the three Forest Plans will lead to improved management, administration, and implementation consistency across the Blue Mountains. This will provide better service to constituents of the three national forests.

Changing Social Values

There have been many changes to society since the Forest Plans were approved in 1990. Changes are evident in population growth, recreation activities, land uses, and urban development. Changes are also evident in people’s values, attitudes, and beliefs regarding public lands. These human issues are one reason the 1990 Forest Plans need to be reviewed.

A description of many of the changes to the local communities and residents is found in Chapter 3 of the Analysis of the Management Situation. An example of a changing social value is an increasing awareness and concern with linking stewardship activities to improve social and economic conditions of communities in the Blue Mountains while recognizing changes in the broader social context of a global economy. Another example is the widely varying values that people hold to describe what a balance of the social, economic, and environmental benefits from the national forests means to them.

Over the past 14 years, natural resource management activities have been planned and implemented in a way that emphasizes greater attention to collaborative involvement and decision-making. These efforts have increasingly changed how people expect to be involved in forest planning processes and how they expect to be able to contribute to integrating resource needs and meeting concerns through partnerships with the Forest Service.

Laws, Regulations, and Policy

Since the 1990 Forest Plans were finalized, there have also been many changes to the direction that guides natural resource management. This direction is found in laws; regulations that implement laws; Forest Service directives (Manuals and Handbooks); and internal agency policy. Internal policy comes to forests through letters from the Chief of the Forest Service and from Regional Foresters. Also refer to the following section titled “Evolving Agency Direction since Forest Plans were Adopted” for additional information.

As outlined in previous sections of this document, numerous new policies have been put into effect since the 1990 Forest Plans were adopted. These include, but are not limited to: the Roadless Area Conservation Rule, the Federal Wildland Fire Management Policy (USDA and

USDI 1995 and 2003); the Forest Roads Rule and Policy as well as the interim direction known as PACFISH, INFISH, and the Eastside Screens, which amended the 1990 Forest Plans. In addition, there have been numerous court decisions that identify and interpret the implementation of some of the above laws regulations, and policies.

Science Developments

In the past decade, there have been many scientific studies and assessments that address land management issues applicable to the Blue Mountains. Such developments include, but are not limited to the Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin (Quigley et al. 1996), Forest Plan Monitoring and Evaluation Reports, other scientific publications, and studies. Management of threatened and endangered or old growth-dependent species needs are examples of the changes that occur in Forest Plan direction as a result of scientific study or assessments.

In addition, analytical models and data used in models have changed and improved in recent years. New modeling techniques and new data sources will be used in this plan revision. Improved analysis and data should also result in revised estimates of outputs and outcomes that are realistic and attainable. Each revision topic in the Current Management Situation Report and future documents will cite specific sources of scientific information that is used in the planning analysis.

Agency Direction

Since the current Forest Plans were adopted, the Forest Service's policy and resource management direction has continued to evolve. Much of the analysis that will be done through the Forest Plan revision will be based upon an understanding of the sustainable interrelationships and processes involved in protecting ecosystems and managing for multiple-uses.

Recent Listings under the Endangered Species Act

In 1990, when the Forest Plans were implemented, there were two birds (bald eagle, peregrine falcon) and one plant (MacFarlane's four o'clock) listed as threatened or endangered species within the Blue Mountains. Since 1990, several other species and their critical habitats have been listed under the Endangered Species Act (see the Aquatic Species Diversity and Viability section in Chapter 3 of the final Environmental Impact Statement for a list of current threatened and endangered species on the three national forests).

Glossary and Acronyms

Many definitions in this glossary are from the following sources. Some definitions are in general use within the Forest Service. Terms adequately defined in general dictionaries are not necessarily included, though some of those that are less well known are included for the convenience of the reader.

Partial Source List

- National Forest Management Act Regulations ([1982] 36 CFR 219)
- Dictionary of Forestry (Helms 1998)
- Wildland Planning Glossary (USDA Forest Service 1976)
- Wildlife Habitats in Managed Forests: the Blue Mountains of Oregon and Washington (Thomas 1979)
- Forest Service Manual or Forest Service Handbook
- A Glossary of Terms Used in Range Management, Second Edition (Society for Range Management 1974)
- Interior Columbia Basin Ecosystem Management Project Draft Environmental Impact Statement (USDA and USDI 1997)
- Wallowa-Whitman National Forest Land and Resource Management Plan (USDA Forest Service 1990)
- Interior Columbia Basin Ecosystem Management Project Supplemental Draft Environmental Impact Statement (USDA and USDI 2000a)
- Interior Columbia Basin Ecosystem Management Project Final Environmental Impact Statement (USDA and USDI 2000b)
- A Dictionary of Ecology, Evolution, and Systematics (Lincoln et al. 1982)
- Webster's Dictionary
- Hells Canyon National Research Area Public Land Use Regulations (36 CFR 292.41)
- Hells Canyon National Research Area Private Land Use Regulations (36 CFR 292.21)

A

active management: Planned, intentional actions in an area that are specifically designed to obtain a desired objective or result.

active restoration: Refer to restoration.

activity unit: An area on which one or more activities occurs. Activity units may be analogous to stand or timber sale harvest unit (polygon). An activity unit can be a polygon (acres), line (miles) or point (each) geospatial feature.

adaptive management: An approach to natural resource management in which decisions are made as part of an ongoing process. Adaptive management involves planning, implementing, monitoring, evaluating, and incorporating new knowledge into management approaches based on scientific findings and the needs of society. Effects are monitored for the purpose of learning and

adjusting future management actions, which improves the efficiency and responsiveness of management.

administrative site: Areas such as work centers, fire lookouts, permitted ranch headquarters, seed orchards, communication sites, utility corridors, and other areas that are occupied or used by the Forest Service during the administration of work associated with national forest lands.

air pollutant: Any substance in air that could, if in high enough concentration, harm humans, animals, vegetation, or material. Air pollutants may include almost any natural or artificial matter capable of being airborne, in the form of solid particles, liquid droplets, gases, or a combination of these.

air quality: The composition of air with respect to quantities of pollution therein, used most frequently in connection with standards of maximum acceptable pollutant concentrations.

allotment (grazing): Area designated for the use of a certain number and kind of livestock grazing for a prescribed period.

allotment management plan (AMP): A document that specifies the actions from a NEPA decision to be taken to manage and protect the rangeland resources and reach a given set of objectives.

allowable sale quantity (ASQ): The quantity of timber that may be sold from the area of suitable land covered by the Forest Plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the average “annual allowable sale quantity.”

anadromous fish: Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

animal unit: One mature cow of approximately 1,000 pounds, either dry or with calf up to 6 months of age, or the equivalent (one horse, five domestic sheep). This concept is based on a standardized amount of forage consumed.

animal unit month (AUM): The amount of forage required by one mature (1,000 lb.) cow or its equivalent for one month (based upon average forage consumption of 26 lb. of dry matter per day). Refer to head month.

aquatic: Pertaining to water.

Aquatic and Riparian Conservation Strategy (ARCS): A regional strategy designed to restore and maintain the processes that create and maintain conditions in aquatic ecosystems on national forest lands in Oregon and Washington.

aquatic ecosystem: Waters that serve as habitat for interrelated and interacting communities and populations of plants and animals. The stream channel, lake or estuary bed, water, biotic communities and the habitat features that occur therein.

assessment: The collection, integration, examination, and evaluation of information and values.

B

basalt: A finely or fine grained, dark, dense volcanic rock.

basin (river): (1) In general, the area of land that drains water, sediment, and dissolved materials to a common point along a stream channel. River basins are composed of large river systems; (2) in the National Hydrography Dataset (NHD), a 3rd-field hydrologic unit denoted by a six-digit

number (HU6, formerly HUC3), or three two-digit numeric fields. For example, 17 is the numeric code for the Columbia hydrologic region, 1702 represents the Middle Columbia sub-region, and 170702 is the numeric code for the John Day basin. In the Columbia Region, basin areas range from 2.6 to 20.8 million acres and average 8.2 million acres in size. See also: subbasin, watershed, and subwatershed.

benches: Mid-elevation flat or gently sloping sites. Grazing and homesteading/ranching activities were concentrated in these areas, which were also used by American Indians for pasturing livestock. Benches from 2,000 to 4,500 feet generally have potential to support the bunchgrass associations described for the lower and mid-position slopes. Cheatgrass brome, Kentucky bluegrass, and an assortment of annual and perennial forbs (including some noxious weeds) dominate much of the benchland, some of which was severely disturbed by early farming and ranching activities.

beneficial uses: Any of the various uses which may be made of the water, including, but not limited to, domestic water supplies, fisheries and other aquatic life, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics.

best management practices (BMPs): Practice or set of practices that enable a planned activity to occur while still protecting the resource managed, normally implemented and applied during the activity rather than after the activity.

best management practices (BMPs) (Watershed): A practice or a combination of practices, that is determined by the state (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing, or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

big game: Those species of large mammals normally managed as a sport hunting resource. Generally includes; elk, moose, white-tailed deer, mule deer, mountain goat, bighorn sheep, black bear and mountain lion.

biological diversity (biodiversity): The variety and variability among living organisms and the ecological complexes in which they occur.

biophysical: The combination or grouping of biological and physical components in an ecosystem.

biotic: Living.

biomass: Dry weight of organic matter in plants and animals in an ecosystem, both above and below ground.

board-foot: A specialized unit of measure for the volume of rough-sawn lumber and timber in the United States and Canada. It is the volume of a one-foot length of a board one foot wide and one inch thick. It is commonly abbreviated BF. Thousand board-feet can be abbreviated MBF. Similarly, million board-feet can be abbreviated MMBF.

boreal: Pertaining to cool or cold temperature regions of the northern hemisphere; the northern coniferous zone.

broad scale: A large, regional area, such as an entire river basin and typically a multi-state area.

browse: That part of leaf and twig growth of shrubs, woody vines, and trees available for animal consumption.

Bureau of Land Management (BLM): An agency within the U.S. Department of the Interior with land management responsibility for the public domain lands.

C

candidate species: Plant and animal species that may be proposed for listing as endangered or threatened in the future by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS); these species have no legal protection under the Endangered Species Act (ESA).

canopy: In a forest, the branches from the uppermost layer of trees; on rangeland, the vertical projection downward of the aerial portion of vegetation.

canopy cover: The proportion of the forest floor covered by the vertical projection of the tree crowns (Jennings et al. 1999).

capability: The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease.

carrying capacity: The number of animals or plants that can be maintained over a specific period of time on a specified amount of land without damage to either the organisms or the habitat.

cavity: The hollow excavated in a tree that is used by birds or mammals for roosting and/or reproduction.

ceded lands: Lands that American Indian Tribes ceded to the United States by treaty in exchange for reservation of specific land and resource rights, annuities, and other promises in the treaties.

channel (stream): The deepest part of a stream or riverbed through which the main current of water flows.

channel morphology: The dimension (width, depth), shape and pattern (sinuous, meandering, straight) of a stream channel.

coarse woody material: Pieces of woody material derived from tree limbs, boles, and roots in various stages of decay, having a diameter of at least three inches.

co-conveners: A group of participating county commissioners from within the Planning Area that have served as co-meeting managers for the land management plan revision process and assisted in coordinating the public involvement processes and community collaborative workshops.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

cold upland forest: Forests occurring at moderate or high elevations in the subalpine zone characterized by cold, wet winters, and mild, relatively cool and dry summers. Late successional stands are typically dominated by subalpine fir, grand fir, Engelmann spruce, whitebark pine and lodgepole pine. Whitebark pine, lodgepole pine and western larch are more common as early

successional species, but they often persist in older stands. Cold upland forests are adjoined by a treeless alpine zone at their upper edge (often separated by a narrow zone of dwarf or krummholz trees), and by moist upland forests at their lower elevation transition boundary.

collaboration: Working together; to cooperate willingly with an agency or instrumentality with which one is not immediately connected.

commercial thinning: Any type of thinning producing merchantable material at least equal to the value of the direct costs of harvesting.

community resiliency: The ability of communities to adapt to changing ecological, social, and economic conditions.

compaction: Making soil hard and dense and decreasing its ability to support vegetation because the soil can hold less water and air and because roots have trouble penetrating the soil.

compatible: Capable of existing together in harmony.

connectivity: The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. Connectivity is the opposite of fragmentation.

conservation strategy or agreement: Plans to remove or reduce threats to candidate and sensitive species of plants and animals so that a listing as threatened or endangered is unnecessary.

consultation: (1) An active, affirmative process that (a) identifies issues and seeks input from appropriate American Indian governments, community groups, and individuals; and (b) considers their interests as a necessary and integral part of the Forest Service's decision-making process; (2) the federal government has a legal obligation to consult with American Indian Tribes. This legal obligation is based in such laws as the Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, and numerous other executive orders and statutes. This legal responsibility is, through consultation, to consider Indian interests and account for those interests in the decision; (3) the term also refers to a requirement under Section 7 of the Endangered Species Act for Federal agencies to consult with the U.S. Fish and Wildlife Service and/or National Oceanic and Atmospheric Administration Fisheries with regard to federal actions that may affect listed threatened and endangered species or critical habitat.

core area: The combination of core habitat (i.e., habitat that could supply all elements for the long-term security of species of conservation concern) and a core population (a group of one or more local populations that exist within core habitat) constitutes the basic unit on which to gauge recovery within a recovery unit. Core areas require both habitat and the species of conservation concern, and the number (replication) and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist. A core area represents the closest approximation of a biologically functioning unit.

corridor: A tract of land forming a passageway. Can refer to areas of wildlife movement, boundaries along rivers, or the present or future location of transportation or utility rights-of-way within its boundaries.

cover: (1) Trees, shrubs, rocks, or other landscape features that allow an animal to conceal itself partly or fully for protection from predators, or to ameliorate conditions of weather, or in which to reproduce; (2) the area of ground covered by plants of one or more species.

cover type: A category or classification of vegetation defined primarily by its vegetation species composition. Cover type is typically depicted in terms of a genus, species, group of species, or life form of tree, shrub, grass, or sedge of an area.

crown: The part of a tree containing live foliage; treetops.

culmination of mean annual increment (CMAI) (see also mean annual increment): The culmination of mean annual increment of growth is the age in the growth cycle of an even-aged stand at which the average annual rate of increase of volume is at a maximum. In land management plans, mean annual increment is expressed in cubic measure and is based on the expected growth of stands, according to intensities and utilization guidelines in the plan.

culture: The ideals, values, and beliefs that members of a society share to interpret experience and generate behavior that is reflected by their work and thought (Haviland 2002).

cultural resources: An object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties. Cultural resources include the entire spectrum of resources for which the Heritage Program is responsible, from artifacts to cultural landscapes, without regard to eligibility for listing on the National Register of Historic Places

cumulative effects or impacts: Cumulative effects or impacts are the impacts on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Effects and impact are synonymous (40 CFR 1508.7).

D

decommission (building): Demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance.

decommission (road): Permanently closing a road to vehicular use and left in a hydrological maintenance free condition. Decommissioning will include activities such as water barring, out sloping, recontouring, decompaction of road surface, removal of drainage structures, and road barricades as needed.

defensible space: An area surrounding a home or structure that has vegetation characteristics that minimize the spread of wildland fire and allows for safely defending the home against fire.

deferred maintenance: Maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. When allowed to accumulate without limits or consideration of useful life, deferred maintenance leads to deterioration of performance, increased costs to repair, and decrease in asset value. Deferred maintenance needs may be categorized as critical or noncritical at any point in time. Continued deferral of noncritical maintenance will normally result in an increase in critical deferred maintenance. Code compliance (such as safety, Americans with Disabilities Act, Occupational Safety and Health Administration, or environmental), plan direction, best management practices,

biological evaluations other regulatory or executive order compliance requirements, or applicable standards not met on schedule are considered deferred maintenance.

density (stand): An absolute measure of the degree to which an area is occupied by trees and, hence the intensity by which trees are competing for site resources, usually expressed in terms of trees per acre or basal area per acre (Tappeiner 2007).

departure (ecological): The degree of difference between existing ecological conditions and the desired range of conditions.

departure (sale schedule): A sale schedule that deviates from the principle of nondeclining flow by exhibiting a planned decrease in the sale schedule at any time during the planning horizon. A departure is characterized by a temporary increase, usually in the beginning decade(s) of the planning horizon, over the base sale schedule originally established. This increase does not impair the future attainment of desired conditions or the long-term sustained yield capacity.

design criteria: Part Three of the land management plan that provides the parameters, including guidelines, for how future site-specific activities can occur within the context of the plan.

designated critical habitat: Specific areas within the geographical area occupied by a species at the time of listing under Endangered Species Act that contain physical or biological features essential to the conservation of the species.

desired condition: A desired condition is a description of specific social, economic, or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates.

detrimental soil disturbance: A term used by soil scientists to indicate how much adverse soil-movement has occurred in an area following an event or a managed activity. The level of disturbance (considered to be a negative impact) is referred to in four erosion hazard classes: low, medium, high, and very high. The differences between the levels depends upon many subjective visual observations soil scientists have been trained to make during site surveys. These include:

1) the amount of topsoils buried beneath subsoils,
2) the redistribution of soil orders and whether or not nutrients needed for plant growth are lost,
3) the amount of vegetation left remaining on and in the soil,
4) how slope, aspect, and hydrology are altered, and
5) whether the disturbance is further impacted by compaction, or other landform changes (i.e., bank failure, landslides, etc.).

developed recreation: Recreation that requires facilities that in turn result in concentrated use of an area; for example, a campground. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings.

developed site: Facility provided for developed recreation use. Refer to facilities.

diameter at breast height (d.b.h.): A standard method of expressing the diameter of the bole of a standing tree, measured at 4.5 feet from the ground.

disease: A harmful deviation from normal functioning of physiological processes, usually pathogenic or abiotic in origin.

disjunct: Populations that are separated geographically from the main distribution of a species. Many plants with disjunct populations are biologically unique because they are not found again for dozens to over one hundred miles. Disjunct populations are thus rare in this portion of their distribution.

dispersed (recreation): Recreation that does not occur in a developed recreation site; for example, hunting or backpacking.

dispersed campsites: Primitive sites typically used for overnight, dispersed recreation. Usually includes a hardened area around a fire pit, a barren area, and/or user-constructed facility.

displacement: Recreation visits are considered "displaced" or no longer consumed at a site or area when practical maximum capacity thresholds of the site or area are exceeded. Visitors are assumed to completely leave the national forest rather than seek an alternative location for their activity.

disturbance: Any relatively discrete event in time that disrupts ecosystem, watershed, community, or species population structure and/or function and changes resources, substrate availability, or the physical environment. Natural disturbances include, among others, drought, floods, wind, fires, volcanic eruptions, and insects and diseases. Human caused disturbances include, among others, timber harvesting, livestock grazing, and prescribed burning.

disturbance regime: A description of the characteristic types of disturbance on a given landscape; the frequency, severity, and size distribution of these characteristic disturbance types; and their interactions. Disturbance regime refers to the spatial and temporal dynamics of disturbances over a longer time period.

diversity: The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

dry upland forest: Forests generally occurring at low to moderate elevations in the montane vegetation zone, characterized by warm, dry summers, with warm to hot daytime temperatures and cool nighttime temperatures, and cold, wet winters. Late-seral stands are dominated by ponderosa pine, Douglas-fir or grand fir. Ponderosa pine or Douglas-fir will also be found as cover types in early and mid-seral successional stages. Dry forests generally begin where the lower elevation woodlands and shrublands begin to transition into higher sites capable of carrying more substantial forest cover. The moist upland forests form their upper elevation transition boundary.

E

early seral: see succession.

Eastside Screens: Regional Forester's Amendment #2, Interim management direction establishing riparian, ecosystem, and wildlife standards for timber sales on National Forest System lands in eastern Oregon and Washington (USDA Forest Service 1995c).

ecological function: Refer to ecological processes.

ecological integrity: The quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence. (36 CFR 219.19).

ecological processes: The flow and cycling of energy, materials, and organisms in an ecosystem. Examples of ecosystem processes include the carbon and hydrologic cycles, terrestrial and aquatic food webs, and plant succession, among others.

economics: A social science concerned primarily with description, distribution, and consumption of goods and services.

economic well-being: A condition that enables people to work, provide income for their families, and generate economic wealth to local communities, the region, and the nation.

economy: System of production, distribution, and consumption of economic goods.

ecosystem: A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

ecosystem diversity: The variety and relative extent of ecosystem types, including their composition, structure, and processes within all or a part of an area of analysis.

ecosystem management: The use of an ecological approach to achieve multiple-use management of public lands by blending the needs of people and environmental values in such a way that lands represent diverse, healthy, productive, and sustainable ecosystems.

ecosystem function (processes): The major process of ecosystems that regulate or influence the structure, composition, and pattern. These include nutrient cycles, energy flows, trophic levels (food chains), diversity patterns in time/space development and evolution, cybernetics (control), hydrologic cycles and weathering processes.

ecosystem health: A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.

ecosystem services: The combined resources and processes of natural ecosystems that provide benefit to humans, including, but not limited to, the production of food and water, the control of climate and disease, cycling of nutrients and crop pollination, spiritual and recreational benefits, and the preservation or maintenance of biodiversity.

ecosystem sustainability: The ability to sustain diversity, productivity, resilience to stress, health, renewability and/or yield of desired values, resource uses, products, or services from an ecosystem, while maintaining the integrity of the ecosystem over time.

edge: An area where plant communities meet or where successional stages or vegetation conditions within the plant communities come together.

effects: Environmental changes resulting from an action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth–inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects

on air and water and other natural systems, including ecosystems. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects even if on balance the agency believes that the effects will be beneficial (40 CFR 1508.8, 2).

eligible wild and scenic rivers: River segments that have been identified as eligible for inclusion in the national Wild and Scenic Rivers System under the authority of the Wild and Scenic Rivers Act. The river segment must be free-flowing and it must possess one or more outstandingly remarkable scenic, recreational, geological, fish and wildlife, historical, cultural, ecological or other value.

elk security: Effective security for elk includes non-linear areas that are greater than one-half mile from open motorized routes and at least 250 acres in size (Hillis et al. 1991).

emission: A release of air contaminants into the outdoor atmosphere.

endangered species: Species listed under the Endangered Species Act by either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range.

endemic: Occurring naturally in a certain region and distribution. Populations nearly always present, often remaining at low levels, and causing little management concern. Endemism is the occurrence of endemic species in an area.

environmental assessment (EA): A comprehensive evaluation of actions and their predictable short– and long–term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. It is a formal document that must follow the requirements of National Environmental Policy Act, the Council on Environmental Quality, and guidelines and directives of the agency responsible for the project proposal.

environmental impact statement (EIS): A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review. A draft Environmental Impact Statement is released to the public and other agencies for review and comment. A final Environmental Impact Statement is issued after consideration of public comments. A record of decision is based on the information and analysis in the final Environmental Impact Statement.

ephemeral: A channel in which streamflow occurs inconsistently, infrequently, or seasonally and, except during periods of streamflow, does not intersect the local groundwater table.

erosion: The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities; can be accelerated or intensified by human activities that reduce the stability of slopes or soils.

essential fish habitat: Identification by the National Marine Fisheries Service of habitat essential to conserve and enhance federal fishery resources that are fished commercially under the Magnuson-Stevens Fishery Conservation and Management Act.

evaluation: An essential companion activity to monitoring; the tool for translating data gathered by monitoring into useful information that could result in change or adaptive management.

even-aged management: The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, seed tree, or coppice regeneration cutting methods produce even-aged stands.

extirpation: Loss of populations from all or part of a species' range within a specified area.

F

facility: A single or contiguous group of improvements that exists to shelter or to support Forest Service programs. The term may be used in either a broad or narrow context; for example, a facility may be a ranger station compound, lookout tower, leased office, work center, separate housing area, visitor center, research laboratory, recreation complex, utility system, or telecommunications site.

> **upgrade:** Total redesign and construction of a camping facility. Location may change considerably depending on ecological, environmental, or social concerns. The overall goal would be to maintain a rustic appearance but promote designs and materials that would result in lower operation and maintenance costs. Some campground classifications may change to the next higher level but none would exceed a Level 4 site development for this planning period. Accessibility standards would be appropriate to the designated Recreation Opportunity Spectrum (ROS). A change in design standards has the potential to move the Recreation Opportunity Spectrum to a higher development setting although that is not the intent of upgrading a facility.

facilities maintenance (annual): Work performed to maintain serviceability, or repair failures during the year in which they occur. Includes preventive and/or cyclic maintenance performed in the year in which it is scheduled to occur. Unscheduled or catastrophic failures of components or assets may need repaired as a part of annual maintenance.

facilities maintenance (deferred): Work that was not performed when it should have been or when it was scheduled and has been delayed to a future period. Deferred maintenance includes actions not taken to comply with codes for health and safety, accessibility, environmental factors and other compliance requirements or applicable standards. To reduce or eliminate deferred maintenance, rehabilitation or replacement may be necessary.

> **rehabilitation:** Renovation or restoration of an existing fixed asset or any of its components in order to restore the functionality or life of the asset. Because there is no significant expansion or change of purpose for the fixed asset, the work primarily addresses deferred maintenance.
>
> **replacement:** Substitution or exchange of an existing fixed asset or component with one having essentially the same capacity and purpose.
>
> **decommission:** Demolition, dismantling, removal, obliteration, and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance.

fauna: The vertebrate and invertebrate animals of an area or region.

federally listed species: Species that are listed under the Endangered Species Act.

fine-scale: A generally high level of landscape resolution involving greater levels of detail and relatively small areas.

fire cycle, fire frequency: Refer to fire return interval.

fire-dependent systems: Forests, grasslands, and other ecosystems historically composed of species of plants that evolved with and are maintained by fire regimes.

fire intensity: The energy output from a fire or the amount of energy or heat released per unit of time; can be expressed as reaction intensity, fireline intensity, temperature, heating duration, or radiant energy

fire regime: The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention but including the influence of aboriginal burning (Agee 1993; Brown 1995). Coarse-scale definitions for natural fire regimes were developed by Hardy and others (2001) and Schmidt and others (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural fire regimes are classified based on the average number of years between fires (fire frequency or Mean Fire Interval [MFI]) combined with the severity of the fire (the amount of vegetation replacement) and its effect on the dominant overstory vegetation. These five natural fire regimes are as follows:

> **fire regime I:** 0- to 35-year frequency and of low severity (most commonly associated with surface fires) to mixed severity (in which less than 75 percent of the dominant overstory vegetation is replaced).
>
> **fire regime II:** 0- to 35-year frequency and of high severity (stand replacement: greater than 75 percent of the dominant overstory vegetation is replaced).
>
> **fire regime III:** 35 to 200-year frequency and of mixed severity.
>
> **fire regime IV:** 35- to 200-year frequency and of high severity.
>
> **fire regime V:** 200-year-plus frequency and of high severity.

fire regime condition class (FRCC): A classification of the degree of departure from the natural fire regime. The fire regime condition class classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure can result in changes (or risks) to one, or more, of the following ecological components: vegetation (species composition, structural stages, stand age, canopy cover, and mosaic pattern across the landscape); fuel composition; fire frequency, severity, and pattern; and other associated disturbances.

> **condition class 1:** Fire regimes are within the natural (historical) range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition, structure, and pattern) are intact and functioning within the natural (historical) range.
>
> **condition class 2:** Fire regimes have been moderately altered from their natural (historical) range. Risk of losing key ecosystem components is moderate. Fire frequencies have departed from natural frequencies by one or more return intervals (either increased or decreased). This

result in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation and fuel attributes have been moderately altered from their natural (historical) range.

condition class 3: Fire regimes have been substantially altered from their natural (historical) range. The risk of losing key ecosystem components is high. Fire frequencies have departed from natural frequencies by multiple return intervals. Dramatic changes occur to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been substantially altered from their natural (historical) range.

fire severity: Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time.

- Low-severity fire, meaning less than 25 percent average vegetation top-kill
- Mixed-severity fire, meaning greater than 25 and less than 75 percent average vegetation top-kill
- High-severity fire, meaning greater than 75 percent average vegetation top-kill

fire suppression: All work and activities connected with fire-extinguishing operation, beginning with discovery and continuing until the fire is completely extinguished.

fish-producing: Streams, rivers, wetlands, ponds, lakes, and reservoirs that serve as spawning or rearing habitat for fish.

floodplain: The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of off-shore islands, including at a minimum, that area subject to a one percent (100-year recurrence) or greater chance of flooding in any given year (Executive Order 11988, Section 6c); or the area of relatively flat land adjacent to streams that is inundated during times of high flow; or an area formed by the deposition of stream-transported sediment.

floodplain function: Collectively, the normal physical and biological processes that are responsible for the formation and maintenance of river floodplains and the biotic communities that inhabit them.

flow regime: The range of magnitude, duration, timing and frequency of stream flow characteristics of a given stream.

focal species: A small subset of species whose status permits inference to the integrity of the larger ecological system to which it belongs and provides meaningful information regarding the effectiveness of the Plan in maintaining or restoring the ecological conditions to maintain the diversity of plant and animal communities in the Plan Area. Focal species would be commonly selected on the basis of their functional role in ecosystems.

food web: Networks of food chains or feeding relationships by which energy and nutrients are passed from one group of living organisms to another.

forb: Broad-leafed, herbaceous, nongrass-like plant species other than true grasses, sedges, and non–woody plants; fleshy leafed plants; having little or no woody material.

forage: All browse and herbaceous foods that are available to grazing animals. It may be grazed or harvested for feeding. Refer to rangeland vegetation.

forest land: Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest

use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width.

forest roads: Any road wholly or partly within, or adjacent to, and serving the national forest and which is necessary for the protection, administration, and utilization of the national forests and the use and development of its resources (23 USC 101).

Forest Service Handbook (FSH): Directives that provide detailed instructions on how to proceed with a specialized phase of a program or activity.

Forest Service Manual (FSM): A system of manuals that provides direction for Forest Service activities.

fragmentation (habitat): The break-up of a large continuous land area by reducing and dividing into smaller patches isolated by areas converted to a different land type. Habitat can be fragmented by natural events or development activities.

fragmentation (forest): The breakup of a large land forest area into smaller patches isolated by areas converted to a different land type. Opposite of connectivity.

free-flowing: A river or stream that exists or flows in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway (16 U.S.C. §1286).

fuel: Plants or plant parts, both living and dead, capable of burning.

fuel load: The dry weight of combustible forest fuels per unit area; usually expressed as tons per acre.

fuel treatment: Any forest vegetation treatment which alters the continuity, rearranges, or removes forest fuels primarily for the purpose of modifying potential fire behavior and/or lessening resistance to control tactics.

functioning-at-risk: Riparian-wetland areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

G

geographic information system (GIS): An information processing technology to input, store, manipulate, analyze, and display data; a system of computer maps with corresponding site-specific information that can be combined electronically to provide reports and maps.

geologic: Based on geology which is the study of the structure, processes, and chronology of the earth.

geological/geomorphic process: The actions or events that shape and control the distribution of materials, their states, and their morphology, within the interior and on the surface of the earth. Examples of geologic processes include: volcanism, glaciation, streamflow, metamorphism (partial melting of rocks), and landsliding.

goal: Goals are broad statements of intent, other than desired conditions, usually related to process or interaction with the public. Goals are expressed in broad, general terms, but do not include completion dates.

goods and services: The various outputs, including on-site uses, produced from forest and rangeland resources.

government-to-government consultation: The active and continuous process of contacting tribal leadership, soliciting their participation, involvement, comments, concerns, contributions, and traditional knowledge that will assist the agency in making informed decisions in planning, managing and decision-making actions.

graminoid: Grasses and grass-like plants such as sedges and rushes.

grassland: Land on which the vegetation is dominated by grasses, grass-like plants, or forbs.

grazable forestland: Forestland that produces, at least periodically, understory vegetation that can be grazed. In this document, that condition is defined as any forested site with an existing overstory canopy cover less than 60 percent with greater than about 200 pounds of forage production per year per acre.

grazing: The consumption of standing forage by livestock or wildlife.

grazing lands: Any vegetated land that is grazed or has the potential to be grazed by animals (domestic or wild). This includes rangeland and grazable forestland.

grazing permit: Document authorizing livestock to use national forest lands or other lands under Forest Service control for livestock production.

ground fire: A fire that burns the organic material in the soil layer and the decayed material or peat below the ground surface.

groundwater: All of the water that has percolated through the surface soil into the bedrock.

groundwater-dependent ecosystems: Communities of plants, animals, and other organisms whose extent and life processes are dependent on access to or discharge of groundwater. (USDA Forest Service 2012)

group selection regeneration method: A method of regenerating uneven-aged stands in which trees are harvested in small groups, and new age classes are established. The width of groups is commonly approximately twice the height of the mature trees, with smaller openings providing microenvironments suitable for tolerant regeneration, and the larger openings providing conditions suitable for more intolerant regeneration. In the group selection regeneration method, the management unit or stand in which regeneration growth and yield are regulated consists of a landscape containing an aggregation of groups.

guideline: A guideline is a constraint on project and activity decisionmaking that allows for departure from its terms, so long as the intent of the guideline is met. (36 CFR 219.15(d)(3)). Guidelines are established to help achieve a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

H

habitat: A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

harvest (timber): The removal of trees for wood fiber use and other multiple-use purposes.

harvest (wildlife): removal of game animals or fish from a population, typically by hunting or fishing.

head month: One month's use and occupancy of the range by one animal. For grazing fee purpose, it is a month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule, or five sheep or goats. Refer to animal unit month.

headwaters: Beginning of a watershed; the uppermost, unbranched tributaries of a stream.

healthy ecosystem: An ecosystem in which structure and functions allow the maintenance of the desired conditions of biological diversity, biotic integrity and ecological processes over time.

Hells Canyon National Recreation Area Act: The Act of December 31, 1975, as amended (PL 94-199, 89 Statute 117), which established the Hells Canyon National Recreation Area.

herbaceous: Green and leaf-like in appearance or texture; includes grasses, grass-like plants, and forbs, with little, or no woody component.

herbicide: A pesticide used for killing or controlling the growth of plants.

herbivore: An animal that subsists on plants or plant materials, either primarily or entirely.

heterogeneous: quality of consisting of dissimilar or diverse elements, as with mixed habitats or cover types occurring on a landscape; opposite of homogeneous, in which elements are the same.

hiding cover: Vegetation, primarily trees, capable of hiding 90 percent of a standing adult game animal from the view of a human at a distance equal to or less than 200 feet during all seasons of the year that elk or deer use the area. Generally, any vegetation used for security or to escape from danger.

high-severity fire: see fire severity.

historical conditions: see historical range of variability

historical range of variability (HRV): The variation of ecological characteristics and processes over scales of time and space that are appropriate for a given management application. The historical range of variability concept focuses on a distilled subset of past ecological knowledge developed for use by resource managers; it represents an explicit effort to incorporate a past perspective into management and conservation decisions. The pre-European influenced reference period considered is sufficiently long, often several centuries, to include the full range of variation produced by dominant natural disturbance regimes such as fire and flooding and also includes short-term variation and cycles in climate. The historical range of variability can help identify key structural, functional, compositional, and connectivity characteristics, for which plan components may be important for either maintenance or restoration of such ecological conditions.

human-caused disturbance: Refer to disturbance.

hydroelectric: Of or relating to the production of electricity by waterpower.

hydrologic: Refers to the properties, distribution, and effects of water. Hydrology refers to the broad science of the waters of the earth, their occurrence, circulation, distribution, chemical and physical properties, and their reaction with the environment.

hydrologic function: The behavioral characteristics of a watershed described in terms of ability to sustain favorable conditions of water flow. Favorable conditions of water flow are defined in terms of water quality, quantity, and timing.

hydrologic unit: A hydrologic unit is a drainage area delineated to nest in a multi-level, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria

that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, noncontributing, and diversions to form a drainage area with single or multiple outlet points.

hydrologic unit code (HUC): A hierarchical coding system developed by the U.S. Geological Survey to identify geographic boundaries of watersheds of various sizes (12).

> **4th-code HUC** refers a subbasin generally about 450,000 acres in size.
>
> **5th-code HUC** refers to a watershed. These areas generally range from 40,000 to 250,000 acres in size.
>
> **6th-code HUC** refers to a subwatershed hydrologic unit that generally ranges from 10,000 to 40,000 acres in size.

hyporheic: Denoting an area or ecosystem beneath the bed of a river or stream that is saturated with water and that supports invertebrate fauna, which play a role in the larger ecosystem.

I

impacts: Refer to effects.

implement: To carry out.

improvement cutting: An intermediate treatment made in a stand, pole-sized or larger, primarily to improve composition and quality by removing less desirable trees of any species.

infestation: The attack or invasion by parasites or pests.

infiltration: The process by which water seeps into the soil, influenced by soil texture, aspect, and vegetation cover.

infrastructure: The basic facilities, equipment, and installation needed for the functioning of a system; commonly refers to items such as roads, bridges, power facilities, and the like.

INFISH: Regional Forester’s Amendment 4, Inland Native Fish Strategy (USDA Forest Service 1995a). Interim strategies for managing fish–producing watersheds in Eastern Oregon and Washington, Idaho, Western Montana and portions of Nevada.

insecticide: A pesticide employed against insects.

instream flow: Flow of water in its natural setting (as opposed to waters diverted for off-stream uses such as industry or agriculture). Instream flow levels provided for environmental reasons enhance or maintain the habitat for riparian and aquatic life, with timing and quantities of flow characteristic of the natural setting.

integrated pest management: A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resources values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable.

integration: Bringing the values and systems of different disciplines together to address questions with a common framework using consistent techniques and measurement units.

interagency: Involving the Forest Service, Bureau of Land Management, Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, and/or other Federal agencies.

interdisciplinary team: A group of specialists assembled as a cohesive team with frequent interactions to solve a problem or perform a task.

intermediate harvest treatment: A collective term for any harvest treatment or tending designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final regeneration harvest.

intermittent stream: A stream in which the flow of water on the surface is discontinuous, or that alternates between zones of surface and sub-surface flow.

invasion (plant): The movement of a plant species into a new area outside its former range.

invasive plant species: Nonnative plant species that invade or are introduced into an environment or ecosystem in which they did not evolve where they have the ability to compete with, and at times overshadow, the existing native plant species. Invasive species are also likely to cause economic or environmental harm or harm to human health. Invasive species include seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem (with respect to a particular ecosystem). Noxious weeds are a specific type of invasive plants that carry a legal designation due to their potential for detrimental impacts to the environment.

inventoried roadless areas: Those areas identified in the Land Management Plan and listed on a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, (USDA Forest Service 2000), which are held at the Washington Office of the Forest Service, or any update, correction, or revision of those maps through the land management planning process.

invertebrate: Small animals that lack a backbone or spinal column. Spiders, insects, and worms are examples of invertebrates.

issue: A point, matter of controversy, dispute, question of public discussion, or general concern over resource management activities or land uses to be addressed or decided through the planning process. To be considered a significant environmental impact statement issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

K

key species/key forage species: (1) Forage species whose use serves as an indicator to the degree of use of associated species. (2) Those species which must, because of their importance, be considered in the management program.

L

landform: One of the attributes or features that make up the Earth’s surface such as a plain, mountain, or valley, as defined by its particular combination of bedrock and soils, erosion processes, and climatic influences.

land management plan: A document or set of documents that provide management direction for an administrative unit of the National Forest System developed under the requirements of the land management planning regulation at 36 CFR part 219 or a prior planning rule.

landscape: A defined area irrespective of ownership or other artificial boundaries, such as a spatial mosaic of terrestrial and aquatic ecosystems, landforms, and plant communities, repeated in similar form throughout such a defined area.

landscape character: Identifiable image made by particular attributes, qualities, and traits of a landscape.

landscape ecology: The study of the interaction between spatial pattern and ecological processes, that is, the causes and consequences of spatial heterogeneity across a range of scales (Turner et al. 2001).

landscape-level/landscape-scale: Refer to broad-scale.

landscape pattern: Number, frequency, size and juxtaposition of landscape elements (stands and patches) that are important to the determination or interpretation of ecological processes.

landscape structure: The mix and distribution of stand or patch sizes across a given area of land. Patch sizes, shapes, and distributions are a reflection of the major disturbance regimes operating on the landscape.

late seral: see succession.

legacy tree: Old trees that have been spared during past harvest, or have survived stand replacing natural disturbances, and are thus significantly older than the average trees in the general area. This distinguishes them from other 'residual' trees, which may also have been spared from harvest but are not always significantly older than the average trees in the area (Mazurek and Zielinski 2004; Franklin 1990).

lichens: Organisms made up of specific algae and fungi, forming identifiable crusts on soil, rocks, tree bark, and other surfaces. Lichens are primary producers in ecosystems; they contribute living material and nutrients, enrich the soil and increase soil moisture-holding capacity, and serve as food sources for certain animals. Lichens are slow growing and sensitive to chemical and physical disturbances.

litter: The uppermost layer of organic debris on the soil surface, which is essentially the freshly fallen or slightly decomposed vegetation material such as stems, leaves, twigs, and fruits.

local population: A group of individuals that spawn or breed in a particular area; the smallest group of individuals that is known to represent an interacting reproductive unit.

long term: Generally refers to a period longer than 10 years up to 100 years.

long-term sustained yield timber capacity: The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives.

M

maintain: To continue; or keep ecosystem functions, processes, and/or components (such as soil, air, water, vegetation) in such a condition that the ecosystem's ability to accomplish current and future management objectives is not weakened. Management activities may be compatible with

ecosystem maintenance if actions are designed to maintain or improve current ecosystem condition.

major population group: A group of either salmon populations or group of steelhead populations that are geographically and genetically cohesive. The major population group is a level of organization between demographically independent populations and evolutionarily significant units or distinct population segments.

management area: A land area identified within the Planning Area that has the same set of applicable plan components. A management area does not have to be spatially contiguous.

management concern: An issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process.

management practice: A specific activity, measure, course of action, or treatment.

mean annual increment: Mean annual increment of growth is the total increment of increase of volume of a stand (standing crop plus thinnings) up to a given age divided by that age. In land management plans, mean annual increment is expressed in cubic measure and is based on the expected growth of stands, according to intensities and utilization guidelines in the plan.

mechanical fuel treatment: A fuel treatment using mechanical means, such as thinning by chainsaw or machines, mastication, crushing down wood, or piling down wood with machines.

mechanized: Wheeled forms of transportation (including nonmotorized carts, wheelbarrows, bicycles and any other nonmotorized, wheeled vehicle).

mesic: Pertaining to conditions of moderate moisture or water supply; used of organisms occupying moist habitats.

metapopulations: Multiple populations of the same species coexisting in time but not space.

microclimate: The climatic conditions within a small habitat such as: a tree stump, under a boulder, in the space between grasses, or on the side of a slope.

migration corridor: The habitat pathway an animal uses to move from one place to another.

minerals-leasable: Coal, oil, gas, phosphate, sodium, potassium, oil shale, sulphur, and geothermal resources.

minimum impact suppression tactics (MIST): A set of guidelines prescribing safety, fire line procedures, tools, and equipment that has the least impact on the environment during suppression and mop-up phases of fire (NWCG 2014).

mining: Any activity related to the discovery, extraction, and exploration of minerals under the Mining Act of 1872 and the Mineral Leasing Act of 1920 through the use of, among other things, hydraulic equipment, pans, ground sluicing, sluice boxes, rockers, or suction dredges.

mitigation: Measures designed and implemented to counteract environmental impacts or to make impacts less severe.

mixed-severity fire: These fire regimes will have the greatest toll on thinner barked and/or young age classes within the stand. Low intensity fires within the stand will favor overstory fire-resistant species (ponderosa pine, western larch, and Douglas fir). Crown fire potential does exist depending on stand structures and age classes of different stand cohorts of any available ladder fuels. If it occurs, the result will favor the return to grass and forbs.

moist upland forest: forests generally occurring at moderate elevations in the montane vegetation zone, or at the lower end of the subalpine zone. They are adjoined by cold forests at their upper edge and by dry forests at their lower edge. They are characterized by slightly longer growing seasons compared to the cold upland forest, and generally have cooler temperatures and higher precipitation than the lower elevation dry upland forests. Late successional stands are generally dominated by subalpine fir, grand fir or Douglas-fir. Lodgepole pine or western larch often occur as dominant species in early successional moist upland forests. Douglas-fir and western white pine are common mid-seral species.

monitoring: A systematic process of collecting information to evaluate effects of actions or changes in conditions or relationships.

mosaic: A pattern of vegetation in which two or more kinds of communities are interspersed in patches, such as clumps of shrubs with grassland between.

motorized equipment: Any machine powered by a nonliving source. This term does not include motorized river craft or small hand-held devices such as flashlights, shavers, wristwatches, and Geiger counters.

multi-story: Structural arrangement of trees within a stand generally characterized by having more than one distinct horizontal layer of tree crowns. Each layer may also be referred to as a stratum.

multiple-use management: The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output ([1982] 36 CFR § 219.3).

municipal watersheds (public supply watersheds): A watershed that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act) or as defined in state safe drinking water regulations. The definition does not include communities served by a well or confined groundwater unaffected by Forest Service activities.

N

National Environmental Policy Act (NEPA): An act to declare a national policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality.

National Forest Management Act (NFMA): A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of forest plans and the preparation of regulations to guide that development.

National Forest System (NFS): All national forest lands reserved or withdrawn from the public domain of the United States; all national forest lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012); and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

National Forest System road: A classified forest road under the jurisdiction of the Forest Service. The term National Forest System roads is synonymous with the term forest development roads as used in 23 USC 205. Generally referred to as a Forest Road.

National Recreation Trail: Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the national system of trails authorized by the National Trails System Act. National recreation trails provide a variety of outdoor recreation uses.

National Register of Historic Places: A listing (maintained by the U.S. National Park Service) of areas that have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation.

National Wild and Scenic River System: Includes rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition. Refer to Wild and Scenic River.

native species: Species that normally live and thrive in a particular ecosystem. Animals or plants that have historically occupied a given aquatic or terrestrial area.

natural disturbance: (see disturbance).

net public benefits: An expression used to signify the overall long- term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield.

niche: A place or activity for which a thing is best fitted.

noxious weeds: Plants designated as noxious weeds by the Secretary of Agriculture or by the responsible state official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the united states or parts thereof. A noxious weed is one that causes disease or has other adverse effects on the human environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

nutrient cycling: Ecological processes in which nutrients and elements such as carbon, phosphorous, nitrogen, calcium, and others, circulate among animals, plants, soils, and air.

O

objective: A concise, time-specific statement that describes the incremental progress expected to take place to meet goals (desired conditions) over the planning period with respect to estimated quantities of services and accomplishments. Objectives are projections of outcomes based on

certain social, economic, and ecological indicators that measure the plans performance and identify specific opportunities and possible future proposals in terms of ongoing programs and future projects to support the goals for the Planning Area.

off-channel: Aquatic habitats separated from the main stream or river, such as side-channels, oxbows, ponds, or sloughs, which may or may not be directly connected to a river or stream.

off-highway vehicle (OHV): Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

old forest stage: Old forests are ecosystems distinguished by a relative abundance of old trees and related structural attributes. Old forest encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulation of large dead woody material, number of canopy layers, species composition, and ecosystem function. The age at which stands reach the old forest stage and the specific structural attributes that characterize the old forest stage varies by forest type, site conditions, and disturbance regime. Measurable criteria for these attributes have been established for the major forest cover types by the Pacific Northwest Region of the Forest Service (USDA Forest Service 1993). These structure based definitions incorporate minimum numbers of trees per acre of minimum qualifying ages ranging from 150 to 200 years as well as minimum sizes of 21 to 31 inches for several forest types common to this area. Depending largely on the natural disturbance regime, old forest may occur in a single-story stage, called "old forest single-story (OFSS)," or as a multi-storied stage, called "old forest multi-storied (OFMS)."

- **old forest multi-story (OFMS):** This stage of old forest includes multiple age classes and canopy layers, along with large, old trees. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. Overstory diameters are generally greater than 20 inches.
- **old forest single-story (OFSS):** This stage of old forest typically results from low-intensity surface fire. This structure class can include multiple age classes, but generally only includes one main overstory strata. Large, old trees are common. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. Overstory diameters are generally greater than 20 inches.

openings: Natural or artificially created areas characterized by a lack of significant tree or shrub cover. Examples include meadows, clearcuts, and other areas of vegetation that do not provide hiding or thermal cover. When openings are created in the forest by the application of even-aged silviculture, as a minimum, openings in forest stands are no longer considered openings once a new forest is established.

outcome: The long-term results of a program activity compared to its intended purpose (Government Performance and Results Act of 1993 (5 U.S.C. 306)). Outcome is a state of being similar to long-term ecological, social, or economic condition or goal (such as the maintenance of an ecosystem's biodiversity, jobs and income, or the quality of a regions' surface water as measured by indicators).

outdoor recreation activities: Activities such as camping, picnicking, rafting, boating, hiking, rock climbing, fishing, hunting, horseback riding, and the viewing of wildlife or scenery.

outfitting: Providing through rental or livery any saddle or pack animal, vehicle or boat, tents or camping gear, or similar supplies or equipment, for pecuniary remuneration or other gain. The

term guide includes the holder's employees, agents, and instructors. Pecuniary remuneration means monetary reward (Washington Office Amendment 2709.11-95-11, 41-53C).

outputs: A broad term for describing any result, product, service or concern that a system produces by its activities. They are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. The unit of measure should indicate or serve as a proxy for what the recipients get rather than what the agency does in the process of producing the given output. Example: timber sold, recreation use, livestock grazing use, etc. Any good, service, or on-site use that is produced from rural resources.

outstandingly remarkable values: Term used in the Wild and Scenic Rivers Act of 1968; to qualify as outstandingly remarkable, a resource value must be a unique, rare, or exemplary feature that is significant at a regional or national level.

over-snow vehicle: A self-propelled vehicle intended for travel primarily on snow driven by a track or tracks in contact with the snow, and steered by a ski, ski's or tracks in contact with the snow.

overstory: Trees whose crowns constitute the highest horizontal layer of vegetation in a forest stand.

overwinter: To keep livestock or plants alive through the winter by sheltering them, or to be kept alive in this way.

P

PACFISH: Regional Forester's Amendment 3, Interim strategies for managing anadromous fish–producing watersheds in Eastern Oregon and Washington, Idaho, and portions of California (USDA and USDI 1995).

paleontological sites: Areas that contain any remains, trace, or imprint of a plant or animal that has been preserved in the earth's crust before the Holocene epoch.

particulate emissions: Solid particles or liquid droplets that can be suspended or carried in the air, or released as air contaminants into the outdoor atmosphere.

patch: An area of vegetation that is relatively homogeneous internally and differs from surrounding elements.

pathogen: An agent such as a fungus, virus, or bacterium that causes disease.

pattern: The spatial arrangement of landscape elements (patches, corridors, matrix) that determines the function of a landscape as an ecological system.

pesticide: A chemical preparation used to control individuals or populations of injurious organisms.

permittee (livestock): Any entity that has been issued a grazing permit.

phases: Plant communities or seral stages within a steady state connected to each other by community pathways.

plan component: Parts of a national forest land and resource management plan that cannot be changed without a plan amendment analysis as required by the National Environmental Policy Act and the Planning Rule. Plan components include goals, desired conditions, standards, guidelines, objectives, special areas, management areas, and suitable uses and activities.

Planning Area: The area of the National Forest System covered by a regional guide or forest plan.

plant associations: A plant community type based on the land management potential, successional patterns and species composition.

plant communities: Any grouping of plants that have some structural similarity (Johnson and Simon 1987).

plateau: Any comparatively flat area of great extent and elevation; specifically an extensive land region considerably more elevated above the adjacent country; it is commonly limited on at least one side by an abrupt descent.

pool: Portion of a stream where the current is slow, often with deeper water than surrounding areas and with a smooth surface texture. Often occur above and below riffles and generally are formed around stream bends or obstructions such as logs, root, wads, or boulders. Pools provide important feeding and resting areas for fish.

potential natural community: The biotic community that would become established if all successional sequences were completed without interference by humans under present environmental conditions. Natural disturbances are inherent in development.

potential vegetation group (PVG): A group of potential vegetation types grouped on the basis of similar general moisture or temperature environment and similar types of life forms.

precommercial thinning: Thinning generally within stands or size classes considered too small to be harvested commercially, where the removal of trees is not for immediate financial return but to improve the stand by reducing stocking and concentrating growth on the more desirable trees.

prehistoric site: An area that contains important evidence and remains of the life and activities of early societies that did not record their history.

prescribed fire: Any fire ignited by management actions to meet specific objectives. Prescribed fire is intended to mimic natural fire regimes to: 1) reduce the risk of fires burning outside of historic intensities and severities that could substantially reduce long–term productivity; 2) maintain tree species compositions that occur under the natural disturbance regime; 3) reduce competition; 4) increase nutrients; 5) prepare sites for natural regeneration; 6) improve forage resources; 7) enhance/create wildlife habitat; and 8) protect private and public property values. A written, approved prescribed fire plan must exist, and National Environmental Policy Act (NEPA) requirements (where applicable) must be met, prior to ignition.

prescription: A management pathway to achieve a desired objective(s).

present net value (PNV): The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the Planning Area.

primitive recreation: Those types of recreation activities associated with unroaded land, for example: hiking, backpacking, and cross–country travel.

private land: Land not in federal, state, or local government ownership.

productive capacity: The growth and accumulation of plant biomass (primary productivity) as well as the growth of animal species that use the products (secondary productivity). Key elements

of productivity include the physical, chemical, and biological properties of soils which provide for vegetative growth and the accumulation and cycling of nutrients.

productivity: Productivity is based on using natural resources no faster than they are produced or can be replaced and using natural resources without impairment of the long-term productive capacity of the ecosystem from which they are derived.

programmatic agreement (PA): This is a historic preservation document that records the terms and conditions agreed upon to resolve the potential adverse effects of a Federal agency program, complex undertaking or other situations in accordance with the Section 106 review under National Historic Preservation Act (NHPA) [36CFR800.14(b)].

project: An organized effort to achieve an objective identified by location, timing, activities, outputs, effects, and time period and responsibilities for executions.

project-level: Site-specific analysis and planning processes for a specific project or set of projects usually on an individual ranger district.

proposed action: A proposal by a federal agency to authorize, recommend, or implement a management action.

preliminary administratively recommended wilderness area (PARWA): An area that has been determined to meet the criteria to be designated as wilderness and is proposed in this land management plan by the forest supervisor(s) to be recommended to Congress for inclusion into the National Wilderness Preservation System.

public issue: A subject or question of widespread public interest relating to management of the National Forest System.

Q

qualitative: Traits or characteristics that relate to quality and cannot be measured with numbers.

quality of life: Refers to the satisfaction people feel for the places where they live (or may visit) and for the places they occupy as part of that experience.

quantitative: Traits or characteristics that can be measured with numbers.

R

rangeland (range): Lands where the vegetation is predominately grasses, grass-like plants, forbs, or shrubs. Rangelands include natural grasslands, shrublands, savannahs, tundra, most deserts, and riparian and wetland plant communities, including marshes and wet meadows, with greater than about 200 pounds of forage production per year per acre.

rangeland vegetation: Vegetation on all land with rangeland resource objectives or rangeland resource values, including riparian areas. Generally, the focus is on land supporting grass or grass-like plants, forbs, or shrubs during one or more ecological stages. Forested and nonforested sites providing forage and habitat for wild and domestic animal species are included.

rearing habitat: Area in rivers or streams where juvenile salmon and trout find food and shelter to live and grow.

recontour: To move soil back (usually with mechanical or hand tools) to a previous condition thus making an area blend with the natural landscape.

record of decision (ROD): An official document separate from, but associated, with a final environmental impact statement in which a deciding official identifies all alternatives, and specifies which were environmentally preferable, states the decision, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not (40 CFR 1505.2).

recovery plans: A plan for the survival and conservation of species listed under the Endangered Species Act. The Act [Section 4(f)] requires that recovery plans contain: 1) objectives, measurable goals for delisting; 2) a comprehensive list of the actions necessary to achieve the delisting goals; and 3) an estimate of the cost and time required to carry out those actions. In addition, NOAA Recovery Planning Guidelines suggest that recovery plans include an assessment of the factors that led to population declines and/or which are impeding recovery. Finally, it is important that the plans include a comprehensive monitoring and evaluation program for gauging the effectiveness of recovery measures and overall progress toward recovery.

recreation: Leisure time activity such as swimming, picnicking, boating, hunting, and fishing.

> **developed recreation:** Recreation that requires facilities that, in turn, result in concentrated use of an area. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings.

> **dispersed recreation:** A general term referring to recreation use outside developed recreation sites; this includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross–country skiing, and recreation in primitive environments.

recreation opportunity: The availability of choices for users to participate in the recreational activities they prefer within the settings they prefer.

recreation opportunity spectrum: A recreation opportunity setting is the combination of physical, biological, social, and managerial conditions that give value to a place. Thus, an opportunity includes qualities provided by-nature (vegetation; landscape, topography, scenery), qualities associated with recreational use (levels and types of use), and conditions provided by management (developments, roads, regulations). By combining variations of these qualities and conditions, management can provide a variety of opportunities for recreationists. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum divided into six classes: primitive, semi-primitive nonmotorized, semi-primitive motorized, roaded natural, rural, and urban (40 CFR 1505.2).

> **primitive -** Area is characterized by an essentially unmodified natural environment of fairly large size Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

> **semi-primitive nonmotorized –** Area is characterized by a predominantly natural or natural appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but would be subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

semi-primitive motorized – Area is characterized by a predominantly natural or natural appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

roaded natural -Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities

rural -Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities is designed for use by a large number of people Facilities are often provided for special activities. Moderate densities are provided far away from developed sites Facilities for intensified motorized use and parking are available.

urban - Area is characterized by a substantially urbanized environment, although the background may have natural appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, on-site, are predominant. Large numbers of users can be expected, both on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

recreation residences: Privately owned recreation cabins authorized by special use permit on National Forest System land that occupy planned, approved tracts or those groups of tracts established for recreation residence use.

recreation site: Specific places in the national forest other than roads and trails that are used for recreational activities. These sites include a wide range of recreational activities and associated development. These sites include highly developed facilities like ski areas, resorts, and campgrounds. It also includes dispersed recreation sites that have few or no improvements but show the effects of repeated recreation use.

recreation visit: An entry of one person to a recreation site or area of land or water for the purpose of participating in one or more recreation activities for an unspecified period.

recreational facilities: Refers to facilities associated with or required for outdoor recreational activities and includes, but are not limited to, parks, campgrounds, hunting and fishing lodges, and interpretive displays.

recreational river: Refer to Wild And Scenic River.

redd: Nest in gravel of stream bottom where a fish deposits eggs.

reforestation: A reference to a specific reforestation activity used to establish reproduction in a stand. Treatments include tree planting, direct seeding, coppice or root suckers, site preparation for natural reproduction (regeneration), or natural regeneration without site preparation.

refugia: Areas that have not been exposed to great environmental changes and disturbances undergone by the region as a whole; refugia provide conditions suitable for survival of species that may be declining elsewhere.

regeneration: The process of establishing new plant seedlings, whether by natural means or artificial measures (e.g., planting, seeding).

regeneration harvest method: A timber harvest procedure by which a new age class is created. The major methods are clearcutting, seed-tree, shelterwood, single tree selection, group selection and coppice. Regeneration methods are grouped into four categories: coppice, even-aged, two-aged, and uneven-aged.

regulations: Generally refers to the Code of Federal Regulations, Title 36, chapter II, which covers management of the Forest Service.

rehabilitate: To repair and protect certain aspects of a system so that essential structures and functions are recovered, even though the overall system may not be exactly as it was before.

research natural area (RNA): An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In Forest Service usage, Research Natural Areas are areas designated to ensure representative samples of as many of the major naturally–occurring plant communities as possible.

resident fish: Fish that spend their entire life in freshwater; examples include bull trout and westslope cutthroat trout.

resilience: The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

resource: Anything which is beneficial or useful, be it animal, vegetable, mineral, a location, a labor force, a view, an experience, etc. Resources, in the context of land use planning, thus vary from such commodities as timber and minerals to such amenities as scenery, scenic viewpoints, or recreation opportunities.

responsible official: The Forest Service employee who has the authority to select and/or carry out a specific planning action.

restoration: The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. Ecological restoration focuses on reestablishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystems sustainability, resilience, and health under current and future conditions.

riparian area: An area with distinctive soils and vegetation between a stream, or other body of water, and the adjacent upland area consisting of vegetation that requires free, or unbound, water for survival.

riparian-dependent species: Plant species that rely on free or unbound water for establishment and survival, and animal species that would normally occupy, or rely on, riparian habitats.

riparian management areas (RMAs): Portions of watershed where riparian–dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. Riparian management areas include traditional riparian corridors, wetlands,

intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the streams' water, sediment, woody debris, and nutrient delivery system.

fish-bearing streams: Riparian management areas consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest. In degraded or incised streams, the riparian management area should extend from the edge of the active channel to the outer extent of the former floodplain. It is expected that riparian management area widths along fish-bearing streams will not be less than described here.

permanently flowing non-fish-bearing streams: Riparian management areas consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest. In degraded or incised streams, the riparian management area should extend from the water's edge to the outer extent of the former floodplain.

constructed ponds and reservoirs, and wetlands greater than 1 acre: Riparian management areas consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

lakes and natural ponds: Riparian management areas consist of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

seasonally flowing or intermittent streams, wetlands, seeps and springs less than 1 acre, and unstable and potentially unstable areas: This category applies to features with high variability in size and site-specific characteristics. At a minimum, the riparian management areas should include:

- The extent of unstable and potentially unstable areas (including earthflows).
- The stream channel and extend to the top of the inner gorge, or in incised streams, to the edge of the former floodplain.
- The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, extending from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest. A site-potential tree height is the average maximum height of the tallest dominant trees for a given site class.
- Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. Including intermittent streams, springs, and wetlands within riparian management areas is important for full implementation of the Blue Mountains ARCS.

Accurate identification of these features is critical to the correct implementation of the strategy and protection of the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. Fish-bearing intermittent streams are distinguished from non-fish-bearing intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams or travel routes for fish emigrating from lakes. In these instances, the guidelines for fish-bearing streams would apply to those sections of the intermittent stream used by the fish.

riverine: On or near the banks of a river; riparian.

road: A motor vehicle route over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

closed road: A road with all use suspended year–long by an active form of facility management utilizing regulations and appropriate enforcement to secure and ensure user compliance with closure.

open road: A road that has no use restrictions or regulations imposed and is available for use by vehicles at any time during the year.

temporary roads: Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the national forest transportation system and not necessary for long-term resource management (36 CFR 212.1).

road construction: Activity that results in the addition of forest classified or temporary road miles (36 CFR 212.1). New construction activities may include vegetation clearing and grubbing, earthwork, drainage installation, instream activities, pit development or expansion, surfacing (including paving), and aggregate placement.

road decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7703). Road decommissioning activities include revegetation, recontouring, water barring, roadbed scarification or ripping, culvert removal, berm construction, and side cast pullback.

road density: An indicator of the concentration of roads in an area.

road maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

road maintenance levels (MLs): Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria. Roads assigned to maintenance levels 2 through 5 are either constant service roads or intermittent service roads during the time they are open to traffic.

Level 1: Assigned to intermittent service roads during the times they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to acceptable levels and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are prohibit and eliminate.

Roads receiving Maintenance Level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at Maintenance Level 1, they are closed to vehicular traffic, subject to prohibitions and restrictions, and may be available and suitable for nonmotorized users.

Maintenance Level 1 maintenance activities include road condition surveys, evaluation, and monitoring of maintenance needs. Activities include limited equipment operation, opening closed roads, manual cleaning of drainage structures, and vegetation management that stabilizes or reduces erosion. Repairs are scheduled and completed within funding limitations when critical resource damage is reported.

Roadway activities including blading, clearing logs, and noncritical repairs that can be delayed are accomplished when the road is placed in an active status.

Level 2: Assigned to roads open for use by high-clearance vehicles. Providing access for passenger cars is not a consideration. Traffic is normally minor, usually consisting of administrative, permitted, dispersed recreation, and/or other specialized uses. Log hauling may occur. Appropriate traffic management strategies are either to discourage or prohibit passenger cars or to accept or discourage high-clearance vehicles.

Maintenance Level 2 maintenance activities include roadside brushing, hazard-tree removal, surface blading, drainage maintenance, structure maintenance, clearing logs, slide and slip cleanup and repair, sign maintenance and surface replacement. Drainage function and soil stabilization are of prime importance. Many roads in this category have grass in the travel way. User comfort is not a consideration.

Level 3: Assigned to roads open and maintained for travel by prudent drivers in standard passenger cars. User comfort and convenience are not considered priorities.

Roads in this maintenance level are typically low-speed, single-lane, with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are encourage or accept. Discourage or prohibit strategies may be employed for certain classes of vehicles or users.

Maintenance Level 3 maintenance activities include roadside brushing, hazard-tree removal, surface blading, drainage maintenance, structure maintenance, clearing logs, slide and slip cleanup and repair, sign maintenance and surface replacement. Drainage function and soil stabilization are of prime importance. Dust abatement and more frequent blading may be needed on segments of multi-purpose roads.

Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double-lane and aggregate-surfaced. However, some roads may be single-lane. Some roads may be paved and/or dust abated. The most appropriate traffic-management strategy is encourage. However, the prohibit strategy may apply to specific classes of vehicles or users at certain times.

Maintenance Level 4 maintenance activities include roadside brushing, hazard tree removal, surface blading, drainage maintenance, structure maintenance, clearing logs, slide and slip cleanup and repair, sign maintenance and surface replacement. Drainage function and soil stabilization are of prime importance. Dust abatement and more frequent blading may be needed on segments of multi-purpose roads.

Level 5: Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved. Some may be aggregate-surfaced and dust-abated. The appropriate traffic management strategy is encourage.

Maintenance Level 5 maintenance activities include roadside brushing, hazard-tree removal, surface blading, drainage maintenance, structure maintenance, logging out, slide and slip cleanup and repair, sign maintenance and surfacing replacement. Drainage function and soil stabilization are of prime importance. Dust abatement and more frequent blading may be needed on segments of multi-purpose roads. All of the Maintenance Level 5 roads within a national forest have a permanent (paved) surface.

road management objectives: Road management objectives define the level of service provided by a National Forest System road consistent with the surrounding recreation opportunity spectrum (ROS) class.

semi–primitive nonmotorized (SPNM): Most semi-primitive nonmotorized areas do not have developed roads. All motorized traffic is prohibited. Semi-primitive nonmotorized roads provide hiking or equestrian trails on closed or decommissioned roads.

semi–primitive motorized (SPM): Semi-primitive motorized roads are generally used for four-wheel drive, logging, or ranching activities. Passenger-car use is discouraged by entrance conditions or signage. Users can expect semi–primitive motorized roads where there are no attractions such as viewpoints or trailheads.

- **low-level SPM:** Native surface roads suitable for high-clearance vehicles but not passenger cars or vehicles towing trailers. Users may need to back vehicles for long distances when meeting oncoming traffic. Maintenance activities occur usually every five years or when resource needs are identified. Roads are allowed to “brush in” and users are responsible for removing trees blocking the road. Ruts and potholes are accepted if they do not contribute to sediment loading. Corresponds to road Maintenance Level 2 and Traffic Service Level D (abbreviated: 2-D).
- **high-level SPM:** Single-lane native surface road or road surfaced with spot rock, strip rock or pit run material suitable for high-clearance vehicles. The road may have infrequent turnouts. Pit run material is applied to the road surface, but is not grid rolled, leaving a rough, rocky surface that drains well and discourages passenger car use. User maintenance is the same as for the low-level semi–primitive motorized. This standard meets resource and safety needs and is the minimum standard for accessing attractions such as viewpoints or trailheads. Maintaining current road alignment, road surface type, and corridor width are emphasized. Corresponds to Maintenance Level 2 and Traffic Service Level C (abbreviated: 2-C).

roaded natural (RN): Roaded natural roads provide safe access for passenger cars. Maintenance activities generally occur annually or every two years, depending on funding and need. Forest Service clears these roads of brush and logs. Surface maintenance increases at higher levels. Because of increased speeds, turnouts are needed more frequently. Open local roads and some collector roads within roaded natural are managed for high-clearance vehicles. In such cases, road-maintenance standards defined for semi–primitive motorized would be used.

- **low-level RN:** Road-surface type of either native or base course. Pit-run material is processed to provide a rough but suitable service for passenger cars. Dust increases during dry conditions, and the road provides good resource protection when wet.

Corresponds to road Maintenance Level 3 and Traffic Service Level C (abbreviated: 3-C).

- **medium-level RN:** Road-surface type of crushed aggregate, maintained for passenger cars. Usually maintained annually, surfaces may “washboard” and become dusty with increased use. Corresponds to road Maintenance Level 3 and Traffic Service Level C or B (abbreviated: 3-C or 3-B).
- **high-level RN:** Road-surface type of an aggregate that has been dust-abated or treated with soil or silicone stabilizers, or asphalt emulsions. A dust-free, smooth surface for passenger cars is the desired product. This standard is often applied to provide double-lane access to attractions such as viewpoints or campgrounds. Corresponds to road Maintenance Level 4 and Traffic Service Level B or A (abbreviated: 4-B or 4-A).

rural (R): Rural is generally the highest standard of road. These arterial roads provide the main access to the national forest lands but generally lack the speeds and alignment provided by state highways. Roads are double–lane with a road-surface treatment and generally 24-feet wide. The road has center striping and often stripes marking the shoulders. Corresponds to a road Maintenance Level 5 and Traffic Service Level A (abbreviated: 5-A).

road prism: an area consisting of the road surfaces and any cut slope and road fill.

road surface types:

asphalt/concrete: A well-graded aggregate and asphalt cement.

paved: One or more bituminous bound layers of aggregate placed on a prepared road foundation.

surface treated: One or more applications of asphalt or other processed or natural materials to a road surface to provide traction, abate dust, protect, or renew the surface without increasing pavement structural capacity. Surface treatment is commensurate with existing surface.

S

salmonids: Fishes of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

salvage harvest: Harvest of dead trees or trees being damaged or dying due to injurious agents other than competition, to recover value that would otherwise be lost. A salvage harvest is an intermediate harvest. If the salvage cutting is heavy enough to require regeneration, it would be correct to use terminology referring to a regeneration harvest method.

sanitation harvest: The removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and diseases. A sanitation harvest is an intermediate harvest. If the sanitation cutting is heavy enough to require regeneration, it would be correct to use terminology referring to a regeneration harvest method.

savannah: The transitional biome between grassland and desert or desert and rainforest, typically having drought resistant vegetation dominated by grasses with scattered tall trees.

scale: (1) The level of resolution under consideration (for example, broad-scale or fine-scale); (2) the ratio of length on a map to true length.

scenery management system (SMS): The scenery management system is the method that was adopted after the Forest Plan was completed in 1990. The scenery management system utilizes two indicators to determine desired landscape character: ecological landscape integrity and scenic integrity. Ecological landscape integrity evaluates whether the landscape is managed in a sustainable and ecologically sound manner. Scenic integrity evaluates whether the landscape character is being managed in a way that conserves constituent values in terms of the level of human-caused deviations that are acceptable to the public (USDA Forest Service 1995b SMS Handbook).

scenic area: Places of outstanding or matchless beauty that require special management to preserve these qualities. They may be established under 36 CFR 294.1 whenever lands possessing outstanding or unique natural beauty warrant this classification.

scenic class: Scenic class indicates the importance or value of a particular landscape determined by constituent information.

scenic identity: The scenic image and identity is the landscape character of an area. The landscape character identifies the “ideal” or optimal set of valued scenery attributes and describes the setting provided by these scenery attributes within each biophysical setting. It is important to understanding of the process, structure, and functions that support the valued set of scenery attributes. This understanding helps identify conditions and stressors that put scenery resources at risk.

scenic integrity level: Measures the degree to which a landscape is free from visible disturbances that detract from the natural or socially valued appearance. Scenic integrity objectives establish the desired level of scenic integrity for an area. Scenic stability measures the degree to which the valued landscape character and its scenery attributes can be sustained through time and ecological progression. Scenic stability objectives establish the desired level of scenic stability for a particular area. It is used to describe an existing situation, an objective for management, or desired conditions.

> **very high scenic integrity:** Scenery with fully intact landscape features and scenic compositions presenting the optimal landscape character in complete harmony, with very minute, if any, scenic discordance. Due to the optimal scenic integrity of the physical, biological, and cultural features in these scenic compositions, the landscape character and sense of place are expressed at the highest possible level. Very high scenic integrity is most compatible with wilderness, backcountry, biophysical, or cultural preserves, and other special classification areas.
>
> **high scenic integrity:** Scenery with whole or nearly intact landscape features and scenic compositions that present the optimal landscape character completely or nearly in full, and contain scenic discordances that are not evident.
>
> **moderately high scenic integrity:** Scenery with slightly altered landscape features and compositions in which the valued landscape character is the dominant scenic impression, yet minor discordance is apparent, but visually subordinate. The “moderate” level of scenic integrity in the Scenery Management Handbook has been split into two categories to reflect more accurately the scenic conditions on the in the Blue Mountains.
>
> **moderately low scenic integrity:** Scenery with altered landscape features and compositions that display a beginning dominance of valued landscape character expression and readily noticeable discordance.

low scenic integrity: Scenery with obviously altered landscape features and compositions that dominate yet still express some aspects of valued landscape character. The scenic harmony of the valued landscape character is seriously fragmented and barely restorable within reasonable periods and resource expenditures.

very low scenic integrity: Scenery with extremely altered landscape features and composition that no longer sustains significant aspects of valued landscape character. The scenic harmony of the optimal landscape character does not exist and its restoration may be impossible if not unrealistic.

scenic integrity objective: An established goal for the management of the scenic resource applied to a specific portion of the national forest.

scenic river: Refer to Wild and Scenic River.

screening: The reduction or elimination of the visual impact of any structure or land modification as seen from any public travel route within the national forests.

sediment: Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

sediment regime: The rate, frequency, magnitude, and duration of sediment movement. Refer to flow regime.

seed tree regeneration method: An even-aged regeneration harvest method in which a new age class develops from seeds that germinate in fully-exposed micro-environments after removal of the previous stand, except for a small number of trees left to provide seed. Any retained trees, referred to as leave trees, should generally comprise less than 10% of the growing space of the stand. When the seed tree method is employed, the sequence of treatments can include three distinct types of cuttings:

1. seed tree preparatory cut - An optional cut that enhances conditions for seed production and/or develop wind firmness for a future seed cut.
2. seed cut - A cut to prepare the seed bed and create a new age class under full sun while retaining trees needed to provide seed needed for regeneration.
3. seed tree removal cut - An optional final removal cut that releases established regeneration from competition with seed trees after they are no longer needed for seed or as leave trees.

self-reliance: Reliance on one’s own capabilities, judgment, or resources through application of outdoor skills in an environment that offers a high degree of risk and challenge.

self-sustaining populations: Populations that are sufficiently abundant, interacting, and well-distributed in the Plan Area, within the bounds of their life history and distribution of the species and the capability of the landscape, to provide for their long-term persistence, resilience and adaptability over multiple generations.

sensitive species: Plant or animal species identified by a regional forester for which population viability is a concern either: 1) because of significant current or predicted downward trends in population numbers or density; or 2) because of significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official state list, or that are

recognized by the regional forester as needing special management to prevent placement on federal or state lists.

seral: Refers to the stages that plant communities go through during the progression in structure and composition over time. Development stages have characteristic structure and plant species composition. See succession for definitions of different seral stages.

shade intolerant: Species of plants that are less tolerant of shaded conditions than other species, and often cannot survive in shaded conditions.

shade tolerant: Species of plants that can tolerate and survive in more shaded conditions than other species can.

shelterwood regeneration method: A method of regenerating an even-aged stand in which a new age class develops beneath the moderated micro-environment provided by the residual trees. Any retained trees, referred to as leave trees, should generally comprise less than 10% of the growing space of the stand. When the shelterwood regeneration method is employed, the sequence of treatments can include three distinct types of cuttings:

1. shelterwood preparatory cut - An optional cut that enhances conditions for seed production and/or develop wind firmness for a future shelterwood establishment cut.
2. shelterwood establishment cut - A cut to establish a moderated micro-environment, prepare the seed bed, and create a new age class.
3. shelterwood removal cut - A final removal cut that releases established regeneration from competition with shelter trees after they are no longer needed for shelter under the shelterwood regeneration method

shrubland: Area of land where the potential vegetation is dominated by shrubs.

short term: Generally refers to a period of 10 years or less.

silviculture: The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

silvicultural system: A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced.

silvicultural treatment: A forest management activity such as thinning, harvesting, planting, pruning, prescribed burning, mastication, or site preparation that is designed to alter the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

single-story: Structural arrangement of trees within a stand generally characterized by having only one distinct horizontal layer of tree crowns. This layer may also be referred to as a stratum.

site: (1) A specific location of an activity or project, such as a campground, a lake, or a stand of trees to be harvested; (2) The location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined or vanished, where the location itself maintains historical or archeological value regardless of the value of any existing structure [36CFR65] (historic or archaeological definition).

snag: A standing dead tree usually greater than five feet in height and six inches in diameter at breast height (d.b.h.).

social well-being: A condition that enables citizens, communities, and visitors to contribute to their wellness, values and quality of life.

society: A group of people who have a common homeland, are interdependent, and share a common culture.

soil: The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

soil function: The characteristic physical and biological activity of soils that influences productivity, capability, and resiliency.

soil productivity: The inherent capacity of a soil to produce plant growth, due to the soil's chemical, physical, and biological properties (such as depth, temperature, water-holding capacity, and mineral, nutrient, and organic matter content). It is often expressed by some measure of biomass accumulation.

soil quality: The capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health.

source habitat: Habitat in such conditions that result in a positive or increasing population growth for a particular species. Those characteristics of vegetation that support long-term wildlife species persistence, or characteristics of vegetation that contribute to stable or positive population growth for a species in a specified area and time. Source habitats are described using dominant vegetation cover type and structural stage combinations that can be estimated reliably at the 247-acre (100-hectare) patch scale. Various combinations of these cover type–structural stages make up the source habitats for the terrestrial species discussed in this Final Environmental Impact Statement, and provide the range of vegetation conditions required by these species for food, reproduction, and other needs (Wisdom et al. 2000).

spatial: Related to or having the nature of space.

special habitat: A habitat which has a special function not provided by plant communities and successional stages. Includes riparian zones, snags, dead and downed wood, and edges (Thomas 1979).

specially designated areas: Also referred to as special areas and is one of the plan components. Areas designated because of their unique or special characteristics, such as botanical areas or areas designated by stature or administrative processes such as wilderness, wild and scenic rivers, or research natural areas.

special use authorization: A permit, term permit lease, or easement which allows occupancy, use, rights, or privileges of national forest lands (36 CFR 251.51).

special use permit: A special authorization which provides permission without conveying any interest in land, to occupy and use national forest land or facilities for specified purpose, and which is revocable, terminable and noncompensable.

species: A population or series of populations of organisms that can interbreed freely with each other but not with members of other species.

species composition: The species that occur on a site or in a successional stage of a plant community (Thomas 1979).

species diversity: The number of species occurring in a given area.

stand: A contiguous group of trees sufficiently uniform in age class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit, such as mixed, pure, even-aged, and uneven-aged stands.

stand density (see also relative stand density): It is an absolute measure of tree occupancy per unit area, like trees per acre or basal area per acre. Stand density indicates the degree to which an area is occupied by trees and, hence the intensity by which trees are competing for site resources (Tappeiner 2007).

stand initiation stage (SI): Structural stage of young stands that develop following a stand-replacing disturbance such as wildfire or a regeneration timber harvest. Growing space is typically reoccupied rapidly by vegetation that either survives the disturbance or colonizes the area. Forest vegetation within these stands literally survive the disturbance above ground, or initiate growth from their underground roots or from seeds stored on-site. Colonizers also disperse seed into disturbed areas, the seed germinates and then new seedlings establish and develop. A single canopy layer of young trees is typically present in this stage. Average dominant tree diameters are usually less than five inches.

stand-replacement fire: A fire severity classification where at least 75 percent replacement of the upper layer of vegetation is removed.

stand structure: General term referring to the collection and spatial arrangement of species, tree sizes, canopy layers, and age-classes in a forest stand.

standard: A standard is a mandatory constraint on project and activity decisionmaking, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

state and transition model: Nonequilibrium ecological model to describe vegetation dynamics of rangeland sites as adopted by the Natural Resource Conservation Service. Models recognize multiple steady states of vegetation and emphasize disturbance processes.

stem exclusion stage: Structural stage is usually created when vigorous, fast growing trees that compete strongly with one another for available light and moisture occupy the growing space. Because trees are taller and the growing space is fully occupied, establishment of new trees is generally precluded by a lack of sunlight or moisture. Individuals that compete unsuccessfully are often stressed or die. These stands typically only have one dominant layer. Average overstory tree diameters usually range from 5 to 20 inches.

strategy: Part two of a land management plan that explains the suitable uses and includes the special designated areas, and management categories.

stream channel: Refer to channel.

stronghold: Directly associated with strong populations. For native fish, strong populations have stable numbers or are increasing, and all major life history forms that historically occurred within the watershed are present.

structure (see also stand structure): (1) Any permanent building or facility, or part thereof such as barns, outhouses, residences, and storage sheds including transmission line systems, substations, commercial radio transmitters, relays or repeater stations, antennas, and other electronic sites and associated structures.

structural stage: One of five distinct classifications of stand structure used in the Final Environmental Impact Statement analysis process including; stand initiation (SI), stem exclusion (SE), understory reinitiation (UR), old forest single-story (OFSS) and old forest multi-story (OFMS).

subalpine: A terrestrial community that generally is found in harsher environments than the montane terrestrial community. Subalpine communities are generally colder than montane and support a unique clustering of wildlife species.

subbasin: In the National Hydrography Dataset, a subdivision of basins, also called HU8 (formerly HUC4) and denoted by an 8-digit numeric code. Subbasins in the Pacific Northwest have drainage areas averaging between 800,000 and 1,000,000 acres. The Upper John Day subbasin, for example, is denoted by the numeric descriptor 17070201; the North Fork John Day subbasin is 17070202, the Middle Fork John Day subbasin is 17070203, and the Lower John Day subbasin is 17070204. See also: basin, watershed, and subwatershed.

subsistence: Customary and traditional uses of wild renewable resources (plants and animals) for food, shelter, fuel, clothing, tools, etc.

subwatershed: In the National Hydrography Dataset, a subdivision of watersheds with drainage areas of approximately 20,000 acres, equivalent to a 6th-field (12-digit) HUC, or HU12 (formerly HUC6). Subwatersheds are the smallest hydrologic units described in the forest plans and FEIS although it is possible to delineate smaller subdivisions, for example HU14 (HUC7) and HU16 (HUC8). See also: basin, subbasin, and watershed.

succession: The sequential replacement over time of one plant community by another, in the absence of major disturbance. Conditions of the prior plant community or successional stage create conditions that are favorable for the establishment of the next stage. The different stages of succession are often referred to as seral stages. Developmental stages are as follows:

> **early seral:** Communities that occur early in the successional path and generally have less complex structural developmental than other successional communities. Seedling and sapling size classes are an example of early seral forests.
>
> **mid-seral:** Communities that occur in the middle of the successional path. For forests, this usually corresponds to the pole or medium sawtimber growth stages.
>
> **late-seral:** Communities that occur in the later stage of the successional path with mature, generally larger individuals, such as mature forests.

suitability: The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

suitable habitat: Habitat that currently has both the fixed and variable stand attributes for a given species habitat requirements. Variable attributes change over time and may include seral stage, cover type and overstory canopy cover.

suitable uses: Uses that are compatible with the desired conditions and objectives for a given area which are identified as guidance for project and activity decisionmaking and do not represent a commitment or final decision approving projects or activities.

surface fire: A fire that burns surface litter, dead woody fuels, other loose debris on the forest floor, and some small vegetation without significant movement into the overstory, usually with a flame less than a few feet high.

surface water development: The practice of diverting or impounding surface water sources by the construction of dams, diversions, canals, or ditches for use, such as irrigation, livestock watering, and human consumption.

surrogate species: A species that represents other species that share similar habitat and risk factors and include Region 6 sensitive species, State-listed species, or other species for which the published literature has identified a concern for their viability. The key characteristic of a surrogate species is that its status and trend provide insights to the integrity of the larger ecological system to which it belongs. Surrogate species serve an umbrella function in terms of encompassing habitats needed for other species, are sensitive to the changes likely to occur in the area, or otherwise serve as an indicator of ecological sustainability.

sustainability: Meeting needs of the present generation without compromising the ability of future generations to meet their needs. Sustainability is composed of desirable social, economic, and ecological conditions or trends interacting at varying spatial and temporal scales, embodying the principles of multiple-use and sustained-yield (FSM 1905).

sustained-yield of products and services: The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land.

T

talus: A slope formed by the accumulation of rock debris at the base of a cliff.

temporal: Related to time.

terrestrial: Pertaining to the land.

terrestrial wildlife: Wildlife species that dwell primarily on land (Thomas 1979).

thermal regulation: The processes by which many animals actively maintain the temperature of all or parts of their body; the protection against local climatic extremes provided by, for example, shade produced by vegetation, protection from wind or sun, or protection from extreme cold.

thinning: An intermediate treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or to recover potential mortality. Variations include crown thinning (thinning from above, high thinning), free thinning, low thinning (thinning from below), mechanical thinning (geometric thinning), and selection thinning (dominant thinning).

timber harvest: The removal of trees for wood fiber utilization and other multiple-use purposes.

timber production: The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For purposes of this subpart, the term timber production does not include production of fuelwood.

timber sale program quantity (TSPQ): The volume of timber planned for sale during the first decade of the planning horizon. It includes the allowable sale quantity (chargeable volume) and any additional volume planned for sale from lands generally suitable for timber harvest. The timber sale program quantity usually is expressed as an annual average for the first decade.

travel corridors: An area of vegetation that provides completely or partially suitable habitat for animals to travel from one location to another.

travel route: A route, such as a county or national forest road or river or trail, that is open for use by members of the public.

treaty-reserved right: Tribal rights or interests reserved in treaties, by Native American Indian Tribes for the use and benefit of their members. The uses include such activities as described in the respective treaty document. Only Congress may abolish or modify treaties or treaty rights.

treaty resource: A resource associated with the language in a specific treaty, usually interpreted to include collections or association of species; not limited to a single species. For example: fish may include all fish species (some treaties included rights to erect temporary houses for curing fish); roots and berries may include a wide variety of plants that will encompass the nature of the plants as they were used historically; grasses are necessarily included for the treaty reserved right to graze cattle or livestock. Hunting rights may include all species of animals hunted in historic and prehistoric times. As these apply to the Forest Service, they are public natural resources on national forest lands, to which American Indian Tribes have reserved certain rights for taking or gathering.

trend: As used to describe range conditions, the direction of change in range or forage condition or in ecological status toward or away from the desired condition.

Tribe: Term used to designate any native American Indian Tribe, band, nation, or other organized group or community which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

trust resource: A resource or property that constitutes a corpus or object of trust that is held in trust status by another (trustee) on behalf of a beneficiary. A trustee is usually a governmental entity (Secretary of the Interior) who is assigned a trust duty to care for resources that are for the exclusive use and benefit of Indian Tribes and/or their members. A beneficiary may be an Indian Tribe or individual tribal member, who has property being held in trust status, for example: land, money, timber, or any Indian-owned asset.

two-aged regeneration method: A planned sequence of silvicultural treatments designed to regenerate or maintain a stand with two age classes. The resulting stand may be two-aged or tend towards an uneven-aged condition as a consequence of both an extended period of regeneration establishment and the retention of reserve trees that may represent one or more age classes. (Two-aged regeneration harvests must comply with National Forest Management Act (NFMA) limitations for even-aged harvest methods).

U

understory: The small trees and other woody species/shrubs whose crowns constitute the lowest horizontal layer of vegetation in a forest stand, growing under the canopy formed by taller trees.

understory reinitiation stage (UR): Structural stage forming as the forest continues to develop and new age classes of trees establish as individual overstory trees die or are removed. The original trees no longer occupy all of the growing space. Regrowth of understory vegetation then

occurs, and trees begin to develop in vertical layers. This stage typically contains multiple layers and multiple tree sizes. Average tree overstory diameters range from 5 to 20 inches.

uneven-aged management: The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

ungulates: Hoofed, plant-eating mammals such as elk, deer, and cattle.

upland: The portion of the landscape above the valley floor or stream.

utility corridor: A parcel of land, without fixed limits or boundaries that is being used as the location for one or more transportation or utility rights-of-way.

V

vector: An organism that carries or transmits a pathogenic agent from one host to another.

vegetation management: Management activities such as thinning, harvesting, planting, pruning, prescribed burning, mastication, or site preparation that is designed to alter the establishment, growth, composition, health, and/or quality of forests, woodlands, grasslands, and shrublands to meet the diverse needs and values of landowners and society on a sustainable basis.

vertebrate: An animal with a backbone; mammals, fishes, birds, reptiles, and amphibians are vertebrates.

viability: In general, viability means the ability of a population of a plant or animal species to persist for some specified time into the future.

viable population: A population that is regarded as having the estimated numbers and distribution of reproductive individuals to ensure that its continued existence is well distributed in the planning area.

vision: Part one of a land management plan that describes the roles, contribution, and desired conditions of the national forest. This section also contains monitoring measures to assess progress toward the desired conditions.

W

water right: A right to use surface water or ground water evidenced by a court decree or by a permit or certificate approved by the state water resources department. Statutory exempt uses of surface water and ground water are not water rights, nor are time-limited licenses. A perfected water right is defined by applicant name, source, purpose, amount (quantity, rate and duty), season of use, priority date, point of diversion, place of use, and certificate number.

water quality: A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

watershed: (1) The region draining into a river, river system, or body of water; (2) also the divide, or ridgeline that separates two adjacent drainages; (3) In the terminology of the National Hydrography Dataset, subdivisions of a subbasin, ranging in size from 40,000 to 250,000 acres;

the fifth level (10-digit) in the hydrologic hierarchy, and also called HU10 (formerly HUC5). See also: basin, subbasin, and subwatershed.

watershed condition classes: Watersheds are rated as Class 1, 2, or 3.

> **Class 1 Condition:** Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Drainage network is generally stable. Physical, chemical, and biological] conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.
>
> **Class 2 Condition:** Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.
>
> **Class 3 Condition:** Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems do not support beneficial uses.

watershed function: The processes acting on hillslopes and stream channel within a drainage basin that control the movement of water, wood, sediment, and nutrients.

watershed integrity: The degree to which the physical and biological processes affecting the movement of water, sediment, wood, and nutrients are operating within normally expected ranges.

watershed runoff: Refer to runoff.

water yield: The amount of water that flows from a watershed within a specific period of time.

wetlands: Those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances do or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds (Executive Order 11990, Section 7c).

wild and scenic river (WSR): Those rivers or sections of rivers designated as such by congressional action under the Wild and Scenic Rivers Act of 1968, as supplemented and amended. Wild and scenic rivers include all national forest lands within the designated wild and scenic river corridor (15). The following classifications are used:

> **wild river areas:** Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.
>
> **scenic river areas:** Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
>
> **recreational river areas:** Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

study river areas: Those rivers formally designated by Congress to be studied under Sections 5(a) and 5(b) of the Wild and Scenic Rivers Act.

wilderness area: An area designated by congressional action under the Wilderness Act of 1964. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wildernesses are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

Wilderness Recreation Opportunity Spectrum (WROS): The Wilderness Recreation Opportunity Spectrum system was developed in conjunction with the Recreation Opportunity Spectrum (ROS). The terminology is similar, although settings are described in terms of pristine, primitive, and semi-primitive settings for wilderness. The descriptions of the primitive and semi-primitive settings for Wilderness Recreation Opportunity Spectrum differ slightly from the Recreation Opportunity Spectrum descriptions and, to avoid confusion with Recreation Opportunity Spectrum settings, are not abbreviated as acronyms.

Pristine: Visitation is very limited. Maintaining a natural and unmodified environment is emphasized. Visitors seldom and only temporarily displace wildlife throughout the year. This is the best opportunity for isolation and solitude, requiring a maximum degree of primitive skills, challenge, and risk. Access is difficult, requiring travel without trails or the use of routes created by animals or previous human visitation.

Primitive: Visitation is limited. The environment is essentially unmodified and natural with no long-term changes to the landscape except for facilities or structures that are deemed historically important to the area or experience. Signs of human use are minimal. Visitation does not displace wildlife during critical periods. High opportunity exists for exploring and experiencing considerable isolation and solitude. Primitive recreation skills are required with a high degree of challenge and risk. Access is via trails maintained to a “most difficult” standard.

Semi-primitive: Visitation is low to moderate. The environment is essentially unmodified and natural, with no long-term changes to the landscape, except for facilities or structures that are historically important to the area or experience. Visitation does not displace wildlife during critical periods. Moderate opportunity exists for exploring and experiencing isolation, independence, and closeness to nature. No-trace camping and primitive skills are required, with a moderate to high degree of challenge and risk. Access is via constructed and maintained trails managed to “more difficult” or “most difficult” standards.

wildfire: An unplanned, unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fire where the objective is to put the fire out.

wildland: A nonurban, natural area that contains uncultivated land, timber, range, watershed, brush or grassland.

wildland fire: Any nonstructure fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires (USDA and USDI 1998).

wildland-urban interface (WUI): The area directly adjacent to home and communities.

winter range: The area available to and used by wildlife (big game) during the winter season. Generally, lands below 4,000 feet in elevation, on south and west aspects, that provides forage and thermal/snow intercept.

woodland: Dry, low elevation areas with a potential vegetation type of juniper.

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Appendices

Appendix A: Blue Mountains Aquatic and Riparian Conservation Strategy

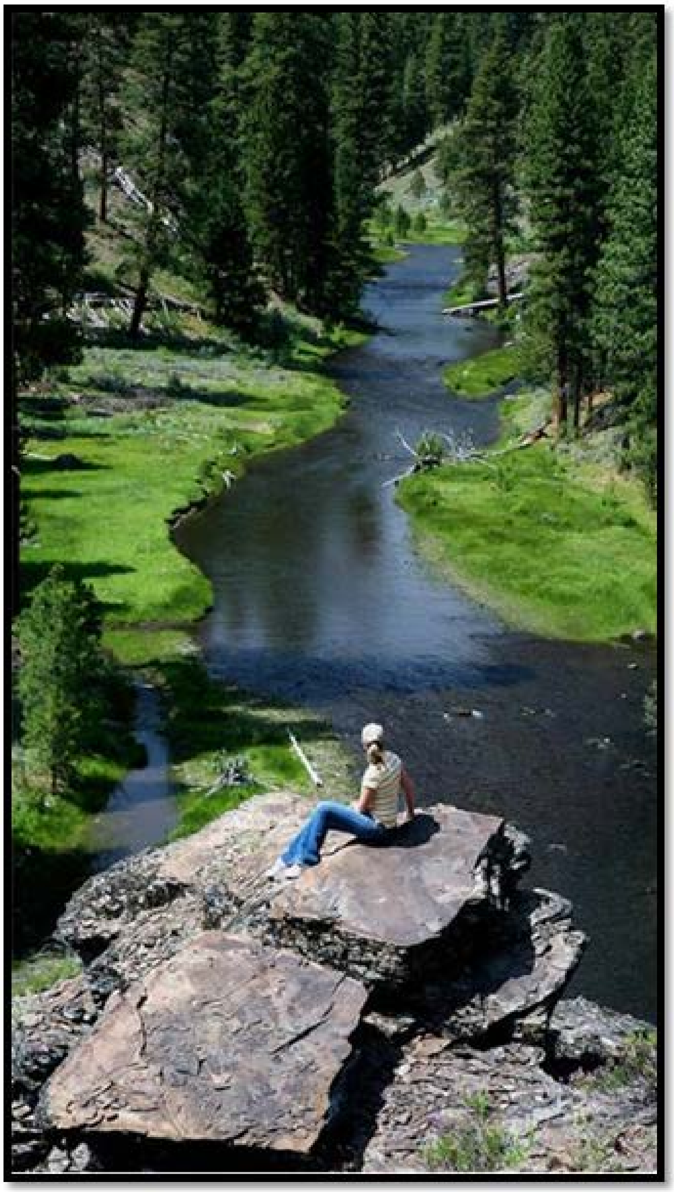
Appendix B: Possible Management Actions

Appendix C: Maps

United States Department of Agriculture

Blue Mountains
Aquatic and Riparian Conservation Strategy

Appendix A to the Malheur, Umatilla and Wallowa-Whitman National Forests Land Management Plans



USDA Forest Service, Pacific Northwest Region
Malheur, Umatilla, and Wallowa-Whitman National Forests 2018

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1. Introduction

Background and Purpose

This appendix presents the components of the Blue Mountains Aquatic and Riparian Conservation Strategy (Blue Mountains Aquatic and Riparian Conservation Strategy) that have been incorporated into the revised land management plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests. The strategy is based on, and part of, a regional strategy (USDA Forest Service 2008, 2016) designed to protect, maintain and restore the ecological health of watersheds and aquatic and riparian ecosystems on National Forest System land throughout the Pacific Northwest Region.

The regional strategy combines the Aquatic Conservation Strategy of the Northwest Forest Plan and elements of the Pacific Anadromous Fish Strategy (PACFISH; USDA Forest Service and USDI Bureau of Land Management 1995) and the Inland Native Fish Strategy (known as INFISH; USDA Forest Service 1995) with the intent of providing a common approach to the protection, conservation and restoration of aquatic and riparian-dependent species on all National Forest System lands in the Pacific Northwest Region. The Aquatic Conservation Strategy, PACFISH, and INFISH share the short-term goal of halting habitat degradation and restoring aquatic and riparian habitats. The strategy presented here shares the stated long-term goal of the Aquatic Conservation Strategy of developing networks of functioning watersheds that support healthy populations of aquatic and riparian-dependent species.

The Blue Mountains Aquatic and Riparian Conservation Strategy pertains only to the national forests in the Blue Mountains: Umatilla, Wallowa-Whitman and Malheur National Forests, as well as the portion of the Ochoco administrated by the Malheur undergoing plan revision. Like PACFISH and INFISH, the focus of this strategy it to protect, maintain, or restore the dynamic ecological processes responsible for creating and sustaining aquatic and riparian habitats and provide high-quality water at subbasin or landscape scales (USDA and USDI 1994a and 1994b). In addition, by means of a memorandum of understanding between Federal land management agencies (the Forest Service and the Bureau of Land Management) and regulatory agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the Environmental Protection Agency), this strategy incorporates elements of the Interior Columbia Basin Ecosystem Management Project Strategy. These elements are intended to complement other efforts that address natural resource management within the Columbia River basin, including recovery plans for listed species, subbasin planning, total maximum daily load development, and Federal, State, and Tribal habitat restoration efforts.

This strategy is intended to replace PACFISH and INFISH direction and will represent the long-term aquatic and riparian habitat conservation strategy for the Blue Mountains that will be part of a regionally consistent strategy for the management of aquatic and riparian resources on Federal lands in the Pacific Northwest.

The Blue Mountains Aquatic and Riparian Conservation Strategy retains the eight riparian goals of PACFISH and INFISH and presents them as desired conditions, along with several additional desired conditions that collectively describe the characteristics of productive watershed, riparian, stream channel, and aquatic habitats and the physical and biological processes necessary for their creation and maintenance. The strategy recognizes that watersheds and the riparian and aquatic habitats within them are dynamic systems that vary over time in response to natural and human caused disturbance (Reeves et al. 1995, Bisson et al. 1997, Beechie and Bolton 1999) and that

salmonid species are adapted to spatially and temporally variable habitats implying that habitat variability is important to their long-term survival (Reeves et al. 1999, Waples et al. 2009).

This strategy and the regional strategy to which it tiers are founded in the premise that the existing strategies (PACFISH, INFISH, and the Aquatic Conservation Strategy) are fundamentally sound, are generally understood by Forest Service personnel, and have significantly improved the management of aquatic resources on National Forest System lands in the Pacific Northwest (Heller et al. 2004, Reeves 2006). Further, monitoring of aquatic habitats within the areas currently managed under PACFISH and INFISH appear to reflect improving habitat conditions at broad scales, indicating that the strategies have been successful at halting habitat degradation at watershed and larger scales and that at least some elements of riparian and aquatic habitat condition are improving (Archer et al. 2009, Meredith et al. 2012, 2013). Similarly, monitoring of within the area of the Northwest Forest Plan have also shown upward trends in aquatic and riparian habitat conditions (Gallo et al. 2005, Reeves et al. 2006, Miller et al. 2015). Despite these improvements, there are still large differences in habitat conditions at managed sites in the Blue Mountains and reference sites located throughout the Columbia River basin (Archer et al. 2009). Reeves et al. (2006) proposed that some improvement may be observed in the short term but full recovery of habitat conditions and the disturbance regimes responsible for their creation and maintenance may take several decades to more than a century to be realized.

An initial summary of PACFISH-INFISH biological opinion effectiveness monitoring data using the first year of repeat sampling at 195 sites in the Columbia River basin presented by Archer and Coles-Ritchie (2007) found neutral to favorable (desired direction) changes in 7 of 12 habitat variables examined. A comparison of repeat data for the Blue Mountains through 2009 (the 4th year of repeat sampling) using similar methods, found neutral to favorable changes in 10 of 13 habitat variables and 9 of 11 vegetation variables, with 50 to 58 percent of sites showing favorable change, averaged across all sites. Figure 1 depicts the presence and distribution of federally listed fish species in the Blue Mountains.

The Blue Mountains Aquatic and Riparian Conservation Strategy includes plan components and other plan content that:

- protect and maintain the ecological integrity of terrestrial and aquatic ecosystems and watersheds, riparian areas, and water quality and water resources;
- restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds, riparian areas, and water quality and water resources;
- contribute to the recovery of federally listed species, conserve proposed or candidate species, and maintain viable populations of species of conservation concern; and
- identify watershed(s) that are a priority for protection, maintenance or restoration.

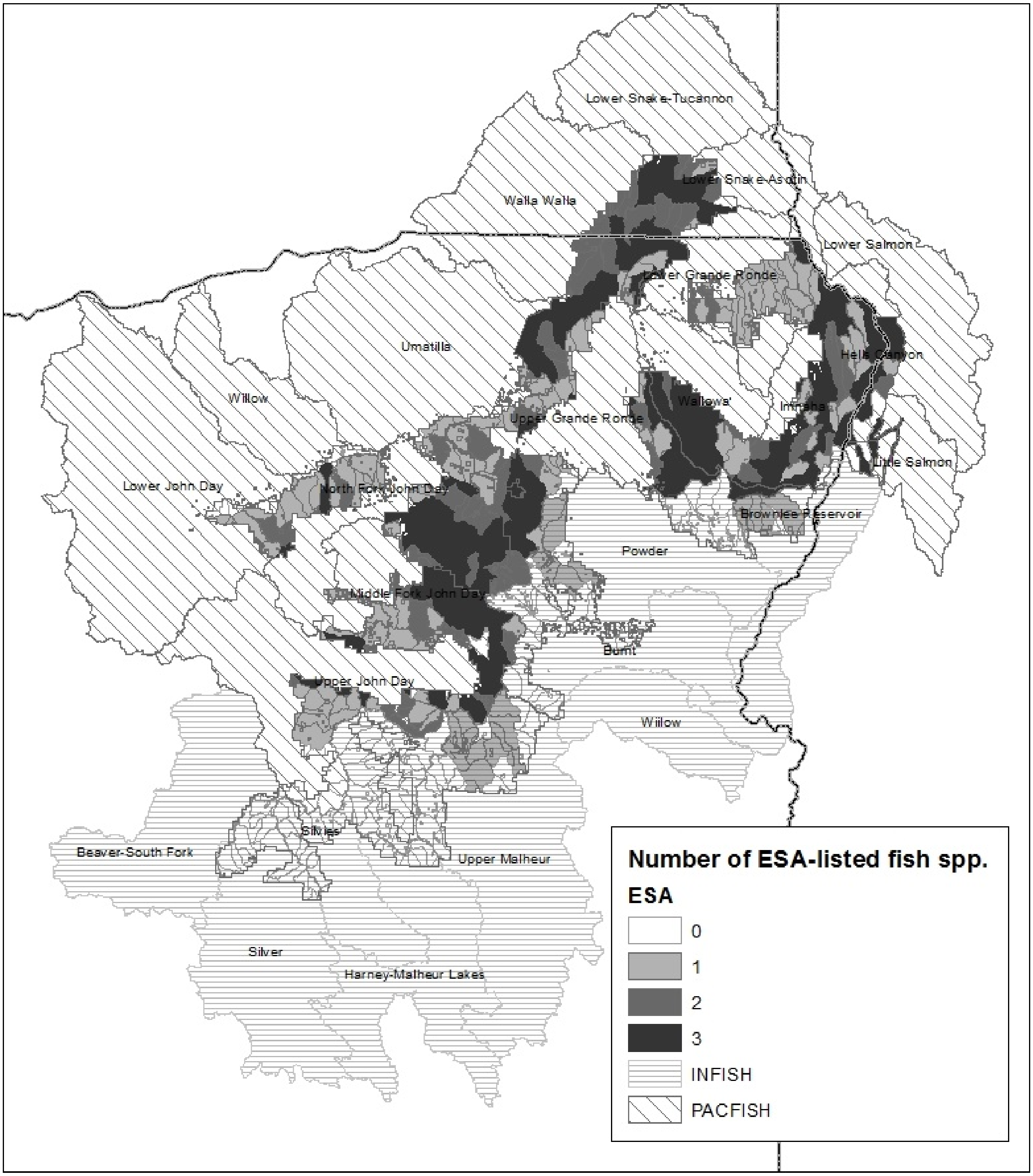

Figure 1. Number of Endangered-Species-Act-listed (federally listed) species by subwatershed within National Forest System lands. Crosshatched areas denote subbasins in which INFISH and PACFISH direction currently applies. Subwatersheds are displayed only within National Forest System boundaries.

2. Resource Context

National Forest System lands in the Pacific Northwest Region play a critical role in the provision of water for consumptive (for example, municipal water supplies) and nonconsumptive uses (for example, instream flows for aquatic ecosystems), both on and off the national forests. For example, 20 to 35 percent of the flow in mainstem Columbia River originates on National Forest System lands. In comparison, data for the Blue Mountains suggests that roughly 70 percent of total streamflow in all of the rivers that originate in the Blue Mountains comes from National Forest System lands (USDA 2014).

National Forest System lands in the Pacific Northwest are critically important to aquatic biota, as they contain over 100,000 miles of streams, about 25,000 miles of which are fish-bearing, as well as numerous lakes and wetlands providing some of best remaining aquatic habitats in the region for some species (for example, Wild Salmon Center 2012). National forests in the Blue Mountains contain roughly 11,000 miles of streams of which roughly half are mapped as fish-bearing streams, including about 3,100 stream miles designated as critical habitat for federally listed bull trout, steelhead, or Chinook salmon.

The quality of water within the national forests is generally high and suitable for most uses (National Research Council 2008). This is largely true of water from National Forest System lands in the region, but an appreciable number of streams and lakes on these lands do not currently meet State standards for one or more water quality parameters and are listed as impaired under the Clean Water Act. Within the river basins encompassing the Blue Mountains, 6,800 stream miles in Oregon and Washington, including 1,500 stream miles on National Forest System lands, do not meet one or more State water quality criteria (WA DOE 2016, OR DEQ 2014).

3. Overview of the Blue Mountains Aquatic and Riparian Conservation Strategy

Strategy

The Blue Mountains Aquatic and Riparian Conservation Strategy integrates and refines the three existing strategies into a single, unified strategy intended to build upon prior successes, incorporate lessons learned, and address new needs. It combines ecosystem and landscape perspectives to forge a management strategy to be applied over a broad, heterogeneous area. It focuses first on broad-scale aquatic resource protection, coupled with strategically focused active restoration in priority areas (USDA Forest Service 2005).

The Blue Mountains Aquatic and Riparian Conservation Strategy is comprised of five elements (figure 2):

1. Riparian management areas
2. Key watersheds
3. Watershed analysis
4. Watershed protection and restoration
5. Monitoring and adaptive management.

Each of these is described below in detail. Interaction of all five elements at the watershed and landscape-scales provides the basis for watershed, aquatic, and riparian ecosystem management and restoration. These components work together and complement each other to achieve the goal

of a distribution of watershed conditions that are resilient to disturbance and that protect, maintain, restore, and enhance water quality for multiple beneficial uses and habitat for inland and anadromous fish, other aquatic organisms, and a variety of wildlife and other riparian-dependent resources (Forest Service Manual 2526) on National Forest System lands in the region. They will not achieve desired results if implemented alone or in limited combination (FEMAT 1993). As such, they are designed to be applied in an integrated fashion.

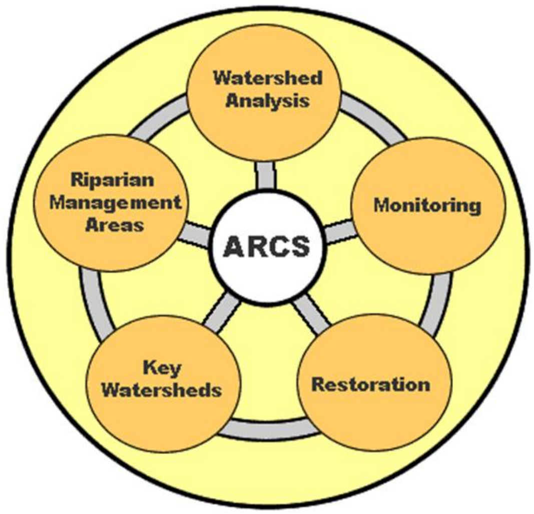

Figure 2. The five primary elements of Blue Mountains Aquatic and Riparian Conservation Strategy

These elements are intended to work together to protect, maintain and restore aquatic and riparian ecosystems and water quality. They are implemented via land management plan components (desired conditions, suitability determinations, objectives, and standards and guidelines), other plan content and other administrative direction (see sections 6 through 11).

Riparian Management Areas

Riparian management areas include lands along permanently flowing streams, ponds, lakes, wetlands, seeps, springs, intermittent and ephemeral streams, and unstable sites that may influence these features. Aquatic and riparian-dependent resources receive primary emphasis in these areas and special management direction applies there. Specifically, management activities in riparian management areas are designed to protect, maintain, or enhance water quality and the ecological health of aquatic and riparian ecosystems and associated resources. These areas function at the ecosystem level (coarse filter) to represent and maintain the full range of aquatic and riparian ecological diversity. The goal is to maintain a certain percentage and distribution in high quality aquatic and riparian ecological diversity and allow a certain percentage and distribution to persist at lower quality aquatic and riparian ecological diversity.

Key Watersheds

Key watersheds are a network of watersheds important to rare species that serve as critical sources of high-quality water for those species. They are also important sources of high-quality water for municipalities. Special management direction applies to these watersheds. They are selected because of their extraordinary resource values. They may serve as strongholds for important aquatic resources or have the potential to do so. They may be areas crucial to threatened or endangered fish and other aquatic and riparian species of concern or interest. Key

watersheds may also comprise areas that provide high-quality water important for maintenance of downstream aquatic and riparian populations. In addition, they could serve as municipal drinking water sources for communities in the region. Management emphasizes minimizing risk and maximizing protection, restoration or retention of ecological health. Because part of the key watershed selection process is based on the habitat requirements of federally listed species and species of conservation concern, the network helps address species-level diversity (fine filter) by conserving critical biophysical processes, restoring critical biophysical processes, or both.

Watershed Analysis

Watershed analysis is an interdisciplinary evaluation of important geomorphic and ecological processes operating in specific watersheds. These analyses (1) evaluate the condition and trend of watersheds, riparian zones and aquatic ecosystems; (2) assess connectivity of the watershed for terrestrial and aquatic flora and fauna species; (3) identify and evaluate resource conditions and trends; and (4) provide the context for management. These types of analyses provide a basis for development of watershed-scale management and restoration strategies and are a tool for more specifically defining desired conditions, developing management objectives and strategies, and designing monitoring strategies.

Watershed Protection and Restoration

The Blue Mountains Aquatic and Riparian Conservation Strategy also includes a more formalized and structured process for watershed protection and restoration than the existing strategies. Specifically, as described in section 10, the Blue Mountains strategy incorporates concepts from the Pacific Northwest Region’s Aquatic Restoration Strategy (USDA Forest Service 2005) and adopts the six-step National Watershed Condition Framework process for planning and implementing watershed restoration.

The Blue Mountains Aquatic and Riparian Conservation Strategy more explicitly recognizes broad-scale aquatic resource protection (passive restoration) during all land management activities as an essential foundation for restoration. The foundation of the passive restoration direction in the plan stems from a suite of robust standards and guidelines, which form the basis for design criteria that mitigate the effects to sensitive resources, such as wetlands and riparian areas. Active restoration builds upon this foundation, through targeted, strategically focused active restoration implemented via the Watershed Condition Framework process of watershed assessment, selection of potential Watershed Condition Framework and Watershed Condition Framework Priority watersheds, and development, implementation and monitoring of multi-year, watershed-scale restoration plans (see sections 6 and 10).

Priority watersheds identified through the Watershed Condition Framework process are expected to generally be a subset of the broader key watershed network. As such, the Blue Mountains Aquatic and Riparian Conservation Strategy incorporates the framework as a near-term (5 to 7 years) implementation process for restoration across the broader, long-term key watershed network. The Blue Mountains Aquatic and Riparian Conservation Strategy also looks to the future by providing a subset of key watersheds that may be selected as Watershed Condition Framework priority watersheds in the future. Through this process, forest plans will be better aligned with the Endangered Species Act and Clean Water Act, as selection of Watershed Condition Framework priority watersheds and identification of needed restoration work will be informed by Endangered Species Act recovery plans and water quality restoration plans for impaired waters.

Under this strategy, land management plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests include quantitative, measureable objectives for restoration. Objectives describe the general scope and scale of various restoration treatments (for example, miles of streams restored, miles of road improved or decommissioned) expected to be implemented during the life of the plan and ultimately, the number of watersheds in which all essential restoration actions are expected to be completed.

Standards and Guidelines

Overall, the Blue Mountains Aquatic and Riparian Conservation Strategy standards and guidelines are quite similar to those in PACFISH and INFISH, although, there are some differences (attachment A). Many of those differences result from the process of integrating and synthesizing direction from three strategies into one. In addition, consistent with recent direction for standards and guidelines (USDA Forest Service 2015), those standards and guidelines associated with procedural requirements (for example, watershed analysis, interagency coordination) were omitted as plan components in the Blue Mountains Aquatic and Riparian Conservation Strategy, as were standards or guidelines that were already addressed by comparable ones.

In addition to these changes, the Blue Mountains Aquatic and Riparian Conservation Strategy includes some new or substantially modified standards and guidelines (section 8). Revised standards RF-7, RF-8 and RF-9 help implement direction to incorporate climate change into decision-making, especially that pertaining to infrastructure (for example, USDA Forest Service 2015, Executive Order-11988). These new road standards provide alignment with new requirements under the Endangered Species Act, while standard KW-1 aligns with new desired conditions by accelerating progress in addressing road impacts in key watersheds. Grazing management guideline GM-3G was developed to (1) provide more consistent, objective, science-based grazing management direction across the entire Blue Mountains; and (2) provide greater certainty of implementation to regulatory agencies and the public, given the current legal and regulatory context in which the Forest Service is managing grazing context (significant areas with threatened, endangered or sensitive fish; waters listed as impaired under the Clean Water Act; or both). It replaces older PACFISH recommended livestock grazing guidelines (USDA and USDI 1995e) that currently apply to only to those areas implementing the PACFISH strategy and some other areas that have chosen to use them. Revised standard FM-2 helps to better manage invasive species risks associated with water use in firefighting and standards FM-1 through FM-12 provide consistency with recent national policy associated with fire retardant application. The updated guideline RMA-4 places additional emphasize on reducing risks associated with invasive species during water drafting.

Monitoring and Adaptive Management

The Blue Mountains Aquatic and Riparian Conservation Strategy includes a more consistent, explicit, and structured approach to monitoring and adaptive management than the existing strategies did when they were originally developed. Per the 2012 Planning Rule, it includes both broad-scale and Forest plan level monitoring. Specific elements are focused on determining whether restoration objectives are being attained, whether water quality best management practices and other standards and guidelines are being implemented and are effective at the site-scale, determining the status and trend of watershed conditions and aquatic ecosystems, assessing changes in the distribution of federally listed aquatic species and species of conservation concern, and tracking the status and trend of stream temperatures (see section 10).

Importantly, the Blue Mountains Aquatic and Riparian Conservation Strategy defines the types of management decisions that will be informed by monitoring information at various spatial and administrative scales. Linkages between monitoring and other components of the Blue Mountains strategy (for example, watershed analysis) are also clearly defined.

Expectations and Limitations

The Blue Mountains Aquatic and Riparian Conservation Strategy is intended to prevent degradation of aquatic and riparian ecosystems and to restore the ecological processes responsible for creating those ecosystems and providing high-quality water over broad landscapes (USDA and USDI 1994b). However, it is built upon the knowledge that watersheds and the aquatic habitat that they contain are dynamic systems and that conditions are variable over time (Reeves 2006, Benda et al. 1998). Processes that control the routing and distribution of water, wood, sediment and nutrients shape aquatic and riparian habitats (Naiman et al. 1992) and result in a distribution of aquatic system states shaped by natural and human-caused disturbance (Benda et al. 1998).

It has been proposed that a complete or near complete range of aquatic habitats can be maintained if anthropogenic disturbance are compatible with the natural disturbance regime to the extent possible and further that when natural disturbances do occur that the transfers of organic (wood) and inorganic (sediment) materials to streams are not impeded (Bisson et al. 1997). The occurrence of natural disturbance (fire, floods, debris flows) implies that habitat conditions vary at any given scale so that it is not expected that all watersheds will be in good condition at all times or necessarily that all habitats within a given watershed will be in good condition at all times. However, comparison of habitat conditions in the Blue Mountains to reference conditions suggests the need for improved aquatic habitat conditions at broad scales.

Implementation of the Blue Aquatic and Riparian Conservation Strategy is expected to substantially contribute to the recovery of federally listed fish, including anadromous salmon and trout, by increasing the quantity and quality of freshwater habitat (FEMAT 1993). It is also expected to significantly contribute toward attainment of Clean Water Act goals of protecting and restoring the quality of the nation’s waters. By itself, however, it is not expected to prevent the listing of species or distinct population segments or enable their full recovery, primarily because factors off National Forest System land often strongly influence populations, particularly those that are migratory. For federally listed migratory fish, factors outside the responsibility of Federal land managers contribute to the status and trends of populations. These include the condition of freshwater and estuarine habitats, harvest in commercial and recreational fisheries, management of main stem dams, and the effects of hatchery practices and introductions (National Research Council 1996). Similar limitations apply to water quality.

Climate change is another factor beyond the direct control of Federal land managers. Nonetheless, those managers have a responsibility to address and respond to climate change through adaptation and mitigation. Key adaptation actions relevant to water and aquatic resources are reflected in Blue Mountains Aquatic and Riparian Conservation Strategy.

4. Scientific Basis

This section summarizes the science upon which the Blue Mountains Aquatic and Riparian Conservation Strategy is based.

Aquatic and Riparian Ecosystems

Aquatic and riparian ecosystems are highly dynamic in space and time (Reeves et al. 1995). Ecologically healthy watersheds are maintained by natural disturbances that create spatial heterogeneity and temporal variability in the physical components of the system (Naiman et al. 1992a, Bisson et al. 1997, Miller et al. 2003, Rieman et al. 2015). Natural disturbances have resulted in a mosaic of habitat conditions over time and native fish populations have adapted to this dynamic environment (Naiman et al. 1995, Reeves et al. 1995). Aquatic and riparian ecosystems are resilient to the types of disturbances under which they have developed. Recovery from disturbance may take decades or longer, depending upon its magnitude and extent, but some improvements can be expected in 10 to 20 years (Reeves 2006).

Naiman et al. (1992b) described different disturbance regimes based on the frequency and magnitude of disturbance and its location in a watershed (for example, headwaters, middle, or lower reaches). Under natural disturbance regimes, a landscape would have watersheds exhibiting a range of conditions because of the asynchronous nature of large and infrequent disturbance events (Miller et al. 2003). Other studies describe stream systems as complex, branching networks rather than linear systems, providing a better understanding of the ecological processes that link riparian, aquatic, headwater and downstream ecosystems (Fisher 1997, Benda et al. 2004). These perspectives imply that aquatic ecosystems are not in a steady state. Rather, streams are invariably dynamic, and conditions vary in space and time because of periodic events such as wildfire, large storms and subsequent floods, hillslope failures, landslides, debris flows, and channel migration. An important implication is that streams and aquatic ecosystems are linked to the dynamics of both the riparian and upland communities and the watershed and physical processes that shape them.

Small streams[34] serve as critical source areas for high-quality water. Because the spatial extent of headwater streams comprise a major portion of the total catchment area (Sidle et al. 2000, Meyer and Wallace 2001), these and adjacent upland ecosystems are important sources of sediment, water, nutrients, energy, and organic matter for downstream systems (Furniss et al. 2005, Gomi et al. 2002, Meyer et al. 2003, Wipfli et al. 2007). These relationships are illustrated in figure 3.

Headwater streams are sources of energy and serve as conduits for fish, amphibians and other biota, nutrients, energy, and wood, linking upland ecosystems with larger navigable waters downstream (modified from Wipfli et al. 2007).

Riparian ecosystems are among the most diverse, dynamic and complex biophysical habitats on the landscape. They have many interfaces, edges, or ecotones and possess a relatively high diversity of resources. Riparian zones control energy and material flux, are sites of biological and physical interaction at the terrestrial and aquatic interface, support unique vegetation assemblages, provide critical habitats for rare species, and are refuges and source areas for a wide variety of species (Kauffman et al. 2001). Riparian zones also play a critical role in connectivity of watersheds by providing dispersal and travel habitat and corridors across the landscape for both terrestrial and riparian-dependent species. The functions of living and dead vegetation in

[34] Small streams are also called headwater, intermittent, ephemeral, seasonal, low-order, and upper network streams (after Furniss et al. 2005).

riparian zones include regulating bank erosion, providing an adequate and continuous supply of coarse woody debris to streams, and providing shade and microclimate protection. Most vertebrates (for example, 53 percent of wildlife species occurring in Oregon and Washington) use riparian zones for at least part of their activities (Kauffman et al. 2001). Moreover, approximately 25 to 30 percent of plants in Oregon and Washington, respectively, are facultative or obligate wetland species (USDA Natural Resource Conservation Service 2006, FEMAT 1993). These species play a critical role in the productivity, resiliency, and function of riparian zones.

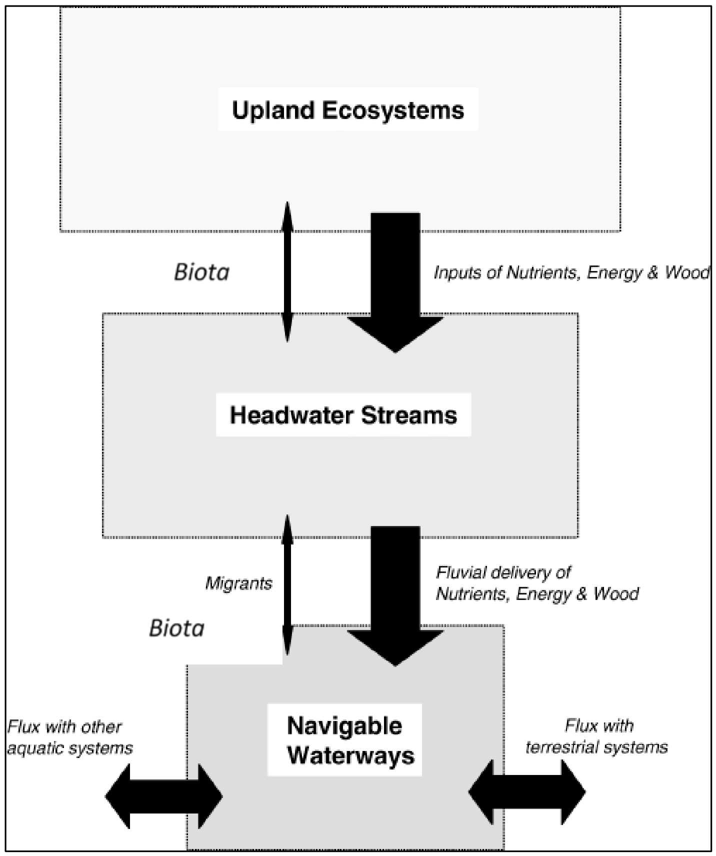

Figure 3. Natural connectivity model between uplands, headwater streams and larger streams and rivers

Ecosystem Disturbance, Sensitivity, and Resilience

The Blue Mountains Aquatic and Riparian Conservation Strategy is intended to contribute to the sustainability of aquatic and riparian ecosystems and species. The basic approach is to maintain and restore the ecological health of watersheds and to retain the ability of riparian and aquatic ecosystems to recover from natural disturbances. This approach stems from recent science suggesting that, to provide for resilient, productive, and persistent natural systems, it is important for management to: 1) conserve natural processes that constrain or influence the structure and variability in landscapes, 2) conserve natural variation or diversity, and 3) account for the influence of scale by identifying and conserving patterns and key processes at multiple spatial and temporal scales (Rieman et al. 2006, Rieman et al. 2015).

Stream habitats are heterogeneous and dynamic in longitudinal (headwaters to larger rivers), lateral (stream, floodplain, riparian area interactions), and vertical (stream channel-hyporheic

interactions) dimensions (Stanford and Ward 1992). Stream and riparian habitats also vary in their response to disturbance (Reeves et al. 1995). Different physical processes may affect aquatic habitat at different spatial and temporal scales. Figure 4 displays the relative frequencies and scales of selected disturbances that may affect stream channels and watersheds, producing spatially and temporally variable habitats and water quality (Montgomery and Buffington 1998). For example, disturbance from storms, debris flows, fires, or a combination of these things are typically more frequent and occur at smaller spatial scales than climate change and tectonic processes. The probability that a particular location will be affected by disturbance at a particular time may be low, but it increases with increasing spatial scale.

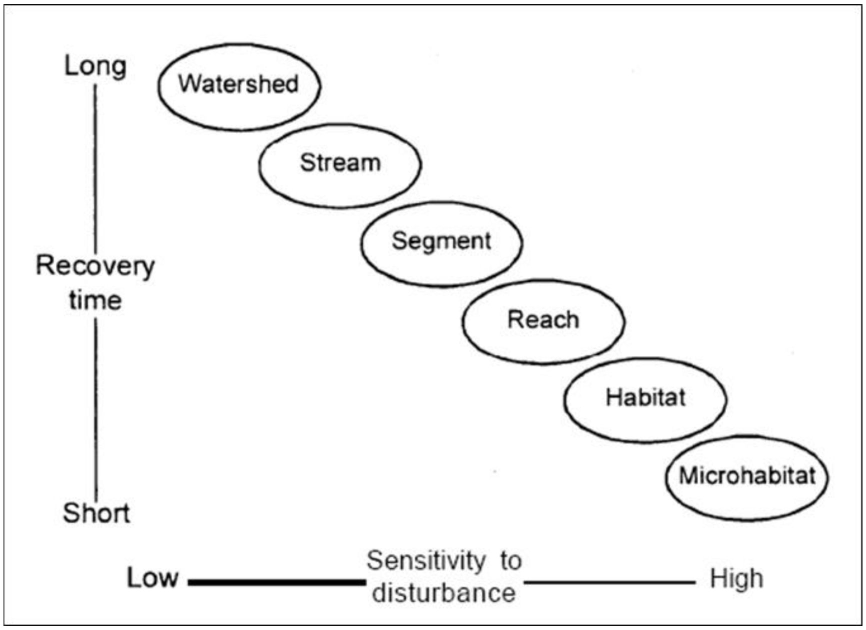

Figure 4. Relationship between sensitivity to and recovery from disturbance at different spatial scales (Frissell et al. 1986, Naiman 1998, Naiman et al. 1992b)

The scale of biological response to disturbance will vary depending upon spatial requirements (for example, home range, territory size, migratory patterns) and temporal constraints (for example, generation time, and migration time) of different species (Rieman et al. 2006). Similarly, the relationship between recovery time and the relative sensitivity to disturbance will vary depending on the relative scale of various habitat and stream features (Figure 5). For example, individual sites have a relatively high sensitivity to disturbance, but relatively short recovery periods. Conversely, watersheds with relatively low sensitivities to disturbance may have relatively long recovery periods (Frissell et al. 1986, Naiman 1998, Naiman et al. 1992b.). Aquatic and riparian ecosystem management needs to account for these processes interacting at multiple scales to establish the context for aquatic resource conservation (Fausch et al. 2002).

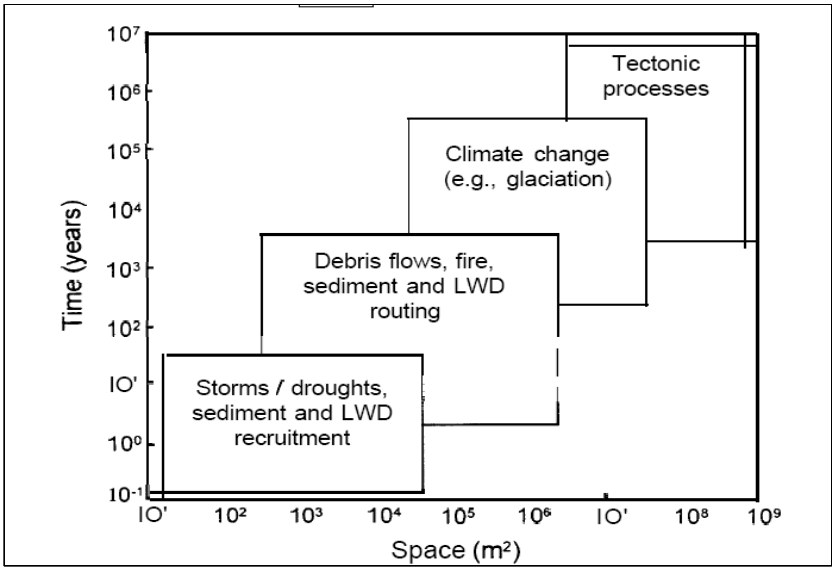

Figure 5. Influences on stream channels at a range of spatial and temporal scales (Montgomery and Buffington 1998)

Allen and Hoekstra (1992) suggest that to understand ecological processes, it is necessary to assess three scales of ecosystem organization concurrently: (1) the scale in question, (2) the scale below that provides mechanisms (dominant processes), and (3) the scale above that gives broader context, role, or relative significance. The relationship between the finest spatial or temporal resolution studied or of interest (grain) and the size of the study area or study duration (extent) determines the scale of processes that can be understood (Wiens 1989).

Ecosystem Management

Management and conservation strategies (Holling and Meffe 1996, Dale et al. 2000), including those involving aquatic organisms (National Research Council 1996, Independent Multidisciplinary Scientific Team 1999), require consideration of large spatial and temporal extents and the conservation of biophysical processes rather than just individual biological and physical elements (Rieman et al. 2015). In the case of many federally listed fish, this necessitates a continued transition from the current focus on relatively small spatial extents with little or no consideration of temporal dimensions, to larger spatial extents (ecosystems and landscapes) over longer (10 to100 years) periods of time (Reeves et al. 1995, Poff et al. 1997, Naiman and Latterell 2005). Williams et al. (1989), for example, found that at the time, no fish species listed under the Endangered Species Act was ever recovered after listing. They attributed this failure to the general focus of recovery efforts on habitat attributes, rather than on restoration and conservation of ecosystem processes. The recent delisting of Oregon chub is a rare success story that stems from its ecosystem management approach.

Factors to be considered in developing ecosystem management plans and policies include the frequency, magnitude, extent, duration (Pickett and White 1985, Hobbs and Huenneke 1992), and context of interacting disturbance regimes (including legacy effects) in managed ecosystems (Hobbs and Huenneke 1992, Reeves et al. 1995, Lindenmayer and Franklin 2002). The resilience of an ecosystem can be reduced if any of these factors are modified. Reduced resilience to disturbance can lead to a decrease in the range of conditions that an ecosystem can experience, extirpation of some species, increases in species favored by available habitats, and an invasion of

exotic species (Lugo et al. 1999, Levin 1974, Harrison and Quinn 1989, Hansen and Urban 1992). The effects of land management on the ecosystem depend on how closely the management disturbance regime resembles the natural disturbance regime with regard to these factors.

The focus of the Blue Mountains Aquatic and Riparian Conservation Strategy on ecological processes and dynamics is well supported in the scientific literature. Ecosystems constantly change through time, they are not in a steady state; periodic disturbance is necessary to maintain the long-term productivity and integrity of an ecosystem (Lugo et al. 1999). Based on recognition of ecosystem dynamics, a key focus of ecosystem management and the Blue Mountains strategy is maintaining or restoring ecological processes and resilience as opposed to attempting to maintain a desired set of static conditions through time (Dale et al. 2000). Ecosystem management also strives to maintain a variety of ecological states or patches in a desired spatial and temporal distribution (Gosz et al. 1999, Concannon et al. 1999).

Ehrenfeld (1992) supports these perspectives, noting that conditions in many ecological communities are in flux because of disturbance. This makes it difficult to determine a normal state. Applying fixed standards developed for ecological conditions at small spatial extents with the expectation of achieving constant conditions over large areas is likely to compromise or decrease the long-term productivity of ecosystems and can create false or unrealistic expectations about the outcomes of policies or regulations (Holling and Meffe 1996, Bisson et al. 1997, Caraher et al. 1999, Dale et al. 2000, Poole et al. 2003).

As such, the Blue Mountains Aquatic and Riparian Conservation Strategy does not include relatively uniform and static quantitative management objectives for stream habitat attributes (for example, pools per mile), known as riparian management objectives, which were incorporated into the PACFISH and INFISH strategies. Instead, as described in Section 11, the dynamic conditions in populations of streams in managed and reference watersheds will be used to track trends at the broad-scale and Forest scale. Moreover, those data along with other information can be used in watershed analysis as a diagnostic tool for assessing conditions in particular watersheds and their causes. Lastly, it can be used to establish more specific desired conditions for individual watersheds (Section 9). Focus will instead be placed on the matrix of diagnostics (anadromous listed-fish) and the matrix of pathways and indicators (bull trout) used in consultation with the Services. These matrices will be used in conjunction with standards and guidelines (for example, WM-1S and RMA-1S) framed around the watershed conditions that measure the following for a variety of metrics:

- functioning appropriately (bull trout) and properly functioning (steelhead and Chinook)
- functioning at risk (bull trout) and at risk (steelhead and Chinook)
- functioning at unacceptable risk (bull trout) and not properly functioning (steelhead and Chinook)

These metrics in combination present a diagnostic tool that will be useful at the project level to determine whether projects are moving toward or away from functional watershed conditions. Additionally, an adaptive strategy will be useful as a mechanism for changing these metrics as the best available science changes over time or where watershed conditions merit a closer look because they do not fall within the ranges specified.

A variety of sources, including interested citizens, interest groups, scientific review and evaluation groups (for example, the Independent Multidisciplinary Scientific Team 1999, National Research Council 1996), regulatory agencies, and policy and decisionmakers have called for development of policies and practices to manage the freshwater habitats of at-risk fish

at ecosystem and landscape extents. In response, the Blue Mountains Aquatic and Riparian Conservation Strategy focuses on larger, varied spatial scales, longer timeframes and use of “coarse” and “fine” filter strategies to maintain and restore aquatic habitat diversity over a range of spatial and temporal scales. The overarching goal of the Blue Mountains strategy is to prevent degradation of riparian and aquatic ecosystems, restore habitat and the ecological processes responsible for creating habitat over broad landscapes (USDA and USDI 1994b). To ensure that management activities help to move watersheds, riparian and aquatic habitats toward desired conditions across the planning area at multiple spatial scales (Franklin and Lindenmayer 2009), the Blue Mountains strategy includes land management plan components (desired conditions, suitable use determinations, standards and guidelines, and monitoring) that apply to riparian management areas wherever they occur. Other applicable plan components include active watershed restoration and monitoring (USDA Forest Service 2008), along with strategic elements that are not plan components (for example, watershed assessments and designation of key watersheds). Success in meeting desired conditions requires full application of all these elements (USDA Forest Service 2008).

The coarse-scale strategy assumes natural disturbances will create and maintain a shifting mosaic of aquatic habitats across the landscape, capable of supporting native aquatic species diversity through time (Haufler et al 1996, Wallington et al 2005). Assuming the Blue Mountains Aquatic and Riparian Conservation Strategy is effective, the proportion of watersheds in good condition is expected to remain the same or increase over time (Reeves et al. 2006); not all watersheds will be in good condition at any point in time, nor will any particular watershed be in a certain condition through time.

The fine-scale strategy refines an earlier coarse-scale concept of a static network of conservation reserves (Nature Conservancy 1982, Frissell and Bayles 1996), by creating a network of key watersheds based on strong local populations and high-quality habitats for a suite of vulnerable surrogate species that may not be sufficiently protected by the disturbance-based coarse-filter strategy alone (Noss 1987, Hunter 1991). These species inhabit a range of aquatic environments in the planning area. We assume the surrogate species and their habitats represent the temporal and spatial variability in habitats needed by other species, and will be sensitive to habitat changes likely to occur. Key watersheds also include readily restorable watersheds for active restoration with the goal of improving connectivity between current strong populations and high-quality habitats, and providing future high-quality areas through time as current high-quality habitats are altered by natural disturbance processes. Select standards and guidelines provide additional fine-scale plan protections for key watersheds and critical habitats for federally listed surrogate species. In the short term (10 to 20 years), full implementation of the fine-scale strategy is intended to protect watersheds that currently have good habitat and fish populations (FEMAT 1993; USDA Forest Service 2008).

Spatial Scales for Watershed and Aquatic Ecosystem Management

Effective watershed and aquatic ecosystem management requires analysis, planning and action across a range of spatial scales. The National Watershed Boundary Dataset provides a consistent basis for this. The spatial scales most relevant to the Blue Mountains Aquatic and Riparian Conservation Strategy are river basin (6-digit hydrologic unit code or 3rd field hydrologic unit code), subbasin (8-digit hydrologic unit code or 4th field hydrologic unit code), watershed (10-digit hydrologic unit code or 5th field hydrologic unit code), subwatershed (12-digit hydrologic unit code or 6th field hydrologic unit code), drainage, and site (figure 6). These terms are used throughout this document.

Aquatic populations have been classified in a manner consistent with the watershed-scale definitions. Bull trout core populations (Whitsell et al. 2004) and anadromous fish populations, for example, have been generally identified at subbasin scales. In addition, bull trout local populations and anadromous fish major and minor spawning areas are generally defined by watersheds or subwatersheds.

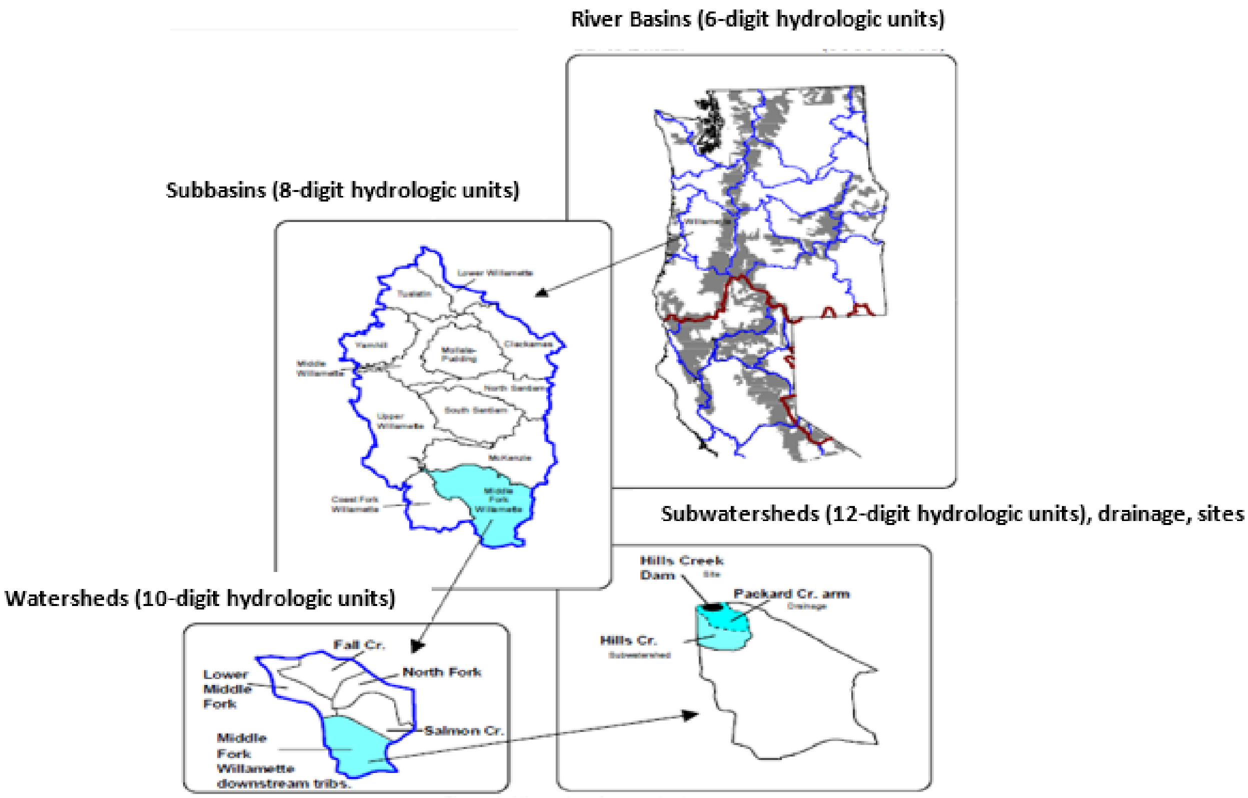

Figure 6. A hierarchy of spatial scales and terms for managing watersheds and aquatic and riparian resources

Riparian Management Areas

Protection and restoration of riparian areas is particularly important to achieving the Blue Mountains Aquatic and Riparian Conservation Strategy goals and objectives. Riparian management strategies differ substantially across the United States and within the Pacific Coastal region (Lee et al. 2004, Everest and Reeves 2007). Key differences include the type and size of riparian areas identified for protection or restoration (for example, riparian management area widths), management goals for them (for example, desired conditions), the kinds and timing of activities that are or are not permissible (for example, suitability), and the nature of management direction used to guide or constrain those activities (for example, standards and guidelines).

The Blue Mountains Aquatic and Riparian Conservation Strategy approach to riparian area management involves designation of relatively large default riparian management areas to protect and restore water quality, habitat for a wide range of aquatic and terrestrial species, and critical ecological processes (see section 6). Watershed analysis can be used to adjust these default riparian management area widths in particular watersheds (Section 9). The scientific basis for this approach was originally provided in FEMAT (1993) and later supported by a review by Everest

and Reeves (2007), who concluded that there was no scientific evidence that either the default prescriptions or the options for watershed analysis in the Northwest Forest Plan provide more protection than necessary to meet stated riparian management goals.

Riparian management areas are not intended as exclusion zones or reserves. Instead, management activities designed to benefit aquatic and riparian-dependent resources and move the landscape towards desired conditions are allowed and encouraged within them. Furthermore, while the Blue Mountains strategy default riparian management areas widths are uniform, the management of them is not intended to be. Instead, a wide range of management activities, involving highly varied prescriptions, is expected to occur within them. These activities are to be planned and implemented based on watershed analyses that lead to project-specific designs that prescribe the types, locations, spatial extent, and timing of the activities. These designs must meet applicable standards and guidelines. This approach recognizes that effective project designs, including identification of both treated and untreated areas, depends on objectives and on local landscape context (Richardson et al. 2012).

Evolving science continues to provide new insights to help inform project-level plans for activities in riparian management areas. Recent scientific syntheses related to Endangered Species Act consultation in western Oregon (USDA Forest Service et al. 2013); for example, provide information about the potential effects of forest thinning on stream temperature, large woody debris, and terrestrial wildlife species. Other recent work (Benda et al. 2016, Olson et al. 2014, and Olson and Burton 2014) provide additional science that can be used to plan and implement management activities in riparian management areas to help achieve desired conditions.

The management approach adopted in the Blue Mountains Aquatic and Riparian Conservation Strategy differs substantially from other strategies that often have different management goals; specify smaller riparian areas; contain more prescriptive and uniform regulatory standards across broad, diverse areas; or a combination of these things. It is consistent, however, with recent trends away from simple, uniform standards towards more complex guidelines that are planned and implemented at larger watershed scales (Lee et al. 2004).

New Threats

Two threats, climate change and invasive species, have emerged as major issues since the existing strategies were first developed in the early to mid-1990s. These threats and the ways in which the Blue Mountains Aquatic and Riparian Conservation Strategy addresses them are described in the following section.

Importantly, these risks and uncertainties do not suggest a need to change the basic structure and components of the Blue Mountains Aquatic and Riparian Conservation Strategy. Instead, they reinforce and amplify the need for this type of strategy, the associated monitoring and adaptive management (Seavey et al. 2009, Furniss et al. 2010). As described below, these threats will also influence the details of how the Blue Mountains strategy is implemented at subbasin, watershed, and site scales (Furniss et al. 2010, Rieman and Isaak 2010, Perry et al. 2015).

Climate Change

Science conducted since the existing strategies were developed has greatly advanced understanding of the potential effects of climate change on water resources and aquatic ecosystems. Some of this knowledge was summarized by the Independent Scientific Advisory Board (ISAB), which provides independent scientific advice and recommendations to the

National Marine Fisheries Service, Columbia River Indian Tribes, and Northwest Power and Conservation Council in 2007 (ISAB 2007).

The Independent Scientific Advisory Board identified the following potential impacts in the Pacific coastal region future: (1) higher temperatures will result in more precipitation falling as rain rather than snow; (2) snowpacks will diminish and seasonal stream flow patterns will be altered; (3) peak river flows will likely increase; (4) summer low flows will be lower; and (5) water temperatures will continue to rise. The magnitude of likely effects and the sensitivity of affected resources varies substantially across the landscape and not all anticipated effects are necessarily harmful to aquatic habitats. In addition, the magnitude of anthropogenic impacts may be much greater than climate impacts. Nonetheless, climate change will likely have major implications for native fishes and aquatic ecosystems.

Climate change is expected to increase large flood events, wildfires, and forest pathogen outbreaks. These could actually improve habitat complexity in some areas as a result of floodplain reconnection and large wood recruitment. However, many climate change effects will likely have negative habitat consequences for aquatic organisms. For example, more frequent severe floods may increase egg mortality due to gravel scour. These effects, however, are unlikely to extirpate entire populations of salmonids because while scour magnitude may increase, the frequency of these events relative to typical salmonid life cycles is relatively low (Goode et al. 2013). Moreover, unconfined portions of the stream network are less susceptible to increased scour than those in confined valleys because overbank flows can spread across floodplains.

Winter snowpacks will likely retreat and runoff earlier in the spring (Mote et al. 2003a and 2003b), potentially impacting species whose migration to the ocean is timed to coincide with plankton blooms (Pearcy 1997). Summer base flows will probably decline. This may shrink the network of perennially flowing streams and thus force fish into smaller channels and less diverse habitats (Battin et al. 2007). Warmer water temperatures would increase physiological stresses and lower growth rates. Summer peak temperatures may approach or exceed lethal levels for salmon and trout (Crozier and Zabel 2006, Crozier et al. 2008). Higher temperatures will also favor species that are better adapted to warmer water, including potential predators and competitors (Reeves et al. 1987). Recent science, however, suggests that stream temperatures in steep, mountain streams of the Pacific Northwest may be less sensitive than those in larger, low gradient rivers (Isaak et al. 2016).

Climate change will likely force shifts in the distribution of fish populations. This could reduce their resilience to natural disturbances, particularly drought (Battin et al. 2007). Streams located high in watersheds that historically provided some of the best habitat may no longer be accessible to migratory fish if snowpack is reduced, thus limiting available rearing areas and access to thermal refugia in summer. Even moderate climate-induced changes may significantly increase the risk of extirpating local populations of Chinook salmon (Crozier et al. 2008). Climate-related factors such as temperature and streamflow could affect habitat in different ways and at different scales, depending on local site characteristics. Therefore, a diversity of conditions is needed for population stability (Crozier and Zabel 2006).

Existing, well-connected, high-elevation habitats on public lands will be important to supporting salmon survival and recovery as the climate continues to warm (Martin and Glick 2008). Protecting, maintaining and restoring these areas is a fundamental objective of the Blue Mountains Aquatic and Riparian Conservation Strategy. The strategy incorporates numerous adaptive actions relevant to climate change. These include maintaining instream flows by managing water withdrawals, reducing flood peaks by enhancing floodplain connectivity and

disconnecting roads from streams, reconnecting isolated habitats by removing anthropogenic barriers, managing riparian forests to provide shade and other functions, and improving waters where aquatic habitats and water quality have been degraded (Furniss et al. 2010). Importantly, some of these actions can more than offset the effects of climate change in some situations (Diabat et al. 2016). Actual impacts to aquatic ecosystems will be highly dependent on the degree to which these adaptation actions are implemented now and in the future. Without them, aquatic habitats may become increasingly isolated, simplified, and less likely to recover after significant disturbance events.

Climate change has been factored into the land management plans in that many of the desired conditions factor climate change into them. The Forest Service has added a monitoring plan component, to insure that monitoring of climate change effects. The Blue Mountains climate change vulnerability assessment and adaptation strategies (for example, Halofsky and Peterson, 2017) will be incorporated into the plans. As the assessment, becomes incorporated, findings will be incorporated, by validating the desired conditions, standards and guidelines, Key and priority watershed selections, integrating additional objectives indicating our commitment to address vulnerable ecosystems and processes in this plan period, and potentially, additional standards and guidelines. The vulnerability assessment utilized the best available science to assess the impacts of changes in stream flows, stream temperatures, and disturbance regimes on water and aquatic resources. The map-based products summarized in the assessment will form the basis for characterizing the relative magnitude, spatial and temporal variability of these effects across the landscape.

Invasive Species

Climate change effects will be compounded by those associated with the distribution of aquatic and terrestrial invasive species, which are likely to intensify in the future. For example, in some large coastal rivers, nonnative species have come to dominate fish assemblages and have largely replaced native fishes within the river food web. The effects of invasive riparian plants on the water quality, nutrient cycling, and the physical habitat of streams and lakes are not fully understood. However, some species have been studied to the degree they raise concern. Japanese knotweed, for example, can displace other riparian vegetation chemically and physically (crowding and shading), but it dies back with the first frost, exposing stream banks to erosive winter stream flow forces until they emerge again in the spring (Urgenson 2009).

The magnitude of these effects will depend on the effectiveness of invasive species prevention and eradication programs, the reinvasion rate of invasive species after control actions are taken, and the speed with which native species reoccupy habitats previously dominated by the non-native species. Effective control will also depend heavily on successful public awareness programs to prevent spread of new invasive species on both public and adjacent private lands. The Forests are committed as part of their management focus to detect, eradicate, control, or contain high priority aquatic invasive species occurrences, where feasible.

The Blue Mountains Aquatic and Riparian Conservation Strategy addresses these issues through specific standards and guidelines focused on preventing or reducing the spread of invasive species. In addition, invasive species will be addressed through watershed protection and restoration, via implementation of Watershed Condition Framework and other treatments outside of priority watersheds.

5. Management Areas

- 36 CFR 219.19 (2012) (d) **Management areas or geographic areas**. Every plan must have management areas or geographic areas or both. The plan may identify designated or recommended designated areas as management areas or geographic areas.
- 36 CFR 219.19 (2012) **Definitions. Management areas.** A land area identified within the planning area that has the same set of applicable plan components. A management area does not have to be spatially contiguous.

Management areas are spatially distinct areas with a unique set of plan components. The management areas range along a continuum from little development by humans in Management Area 1A to extensive human development in Management Area 16. The types of uses and desired settings define the land use that would occur in them under the revised land management plans. They occur across districts, mountain ranges, and ecosystems but have commonalities that make their overarching land uses similar.

Riparian Management Areas

In the revised land management plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests, there are separate management areas identified for riparian areas, emphasizing their importance on the landscape; referred to in the plan as Riparian Management Areas. Riparian management areas are portions of a watershed where riparian–dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines.

Riparian management areas include portions of watersheds where water quality and aquatic and riparian-dependent resources receive primary emphasis and where special management direction applies. They include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the streams' water, sediment, woody debris, and nutrient delivery system. Riparian management areas are used to protect, maintain and restore the riparian structure and function of intermittent and perennial streams, confer benefits to aquatic and riparian-dependent plant and animal species, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, and provide for greater connectivity within and between watersheds for both riparian and upland species. They are also critically important to maintaining and restoring water quality.

Riparian management areas are used as the primary framework (coarse filter) that provides for ecosystem diversity by conserving biophysical processes at the landscape and watershed scales. They provide travel and dispersal corridors for many riparian-dependent animals and plants and provide connectivity between geographically significant areas for both riparian and upland species. Management activities within these areas protect, maintain, or enhance existing functional conditions or restore degraded conditions for aquatic and riparian-dependent species.

Riparian management areas generally parallel the stream network and include areas necessary for maintaining hydrologic, geomorphic, and ecologic processes that influence riparian and aquatic systems. Unstable and potentially unstable areas in headwaters and along streams are primary source areas for coarse wood, fine and coarse particulate organic matter, and sediment (FEMAT 1993). Riparian management areas occur at the margins of standing and flowing water, intermittent stream channels, and ephemeral ponds, springs, and wetlands.

Management of these areas focuses on ecological processes and conditions within and contributing to the value of these areas. Management activities within them contribute to moving

toward or meeting or maintaining desired conditions. The following riparian management areas widths were identified in these forest plans. The scientific basis for them was originally provided in FEMAT (1993) and later supported by a review by Everest and Reeves (2007). Riparian management area widths may only be adjusted based on a watershed analysis.

Fish-bearing streams - riparian management areas consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest. In degraded or incised streams, the riparian management area should extend from the edge of the active channel to the outer extent of the former floodplain. Riparian management area widths along fish-bearing streams will not be less than described here.

Permanently flowing non-fish-bearing streams - riparian management areas consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest. In degraded or incised streams, the riparian management area should extend from the edge of the active channel to the outer extent of the former floodplain.

Constructed ponds and reservoirs, and wetlands greater than 1 acre – riparian management areas consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Lakes and natural ponds - riparian management areas consist of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Seasonally flowing or intermittent streams, wetlands, seeps and springs less than 1 acre, and unstable and potentially unstable areas - This category applies to features with high variability in size and site-specific characteristics. At a minimum, the riparian management areas will include:

- The extent of unstable and potentially unstable areas (including earthflows).
- The stream channel and extend to the top of the inner gorge, or in incised streams, to the edge of the former floodplain.
- The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, extending from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance on either side of the stream, whichever is greatest. A site-potential tree height is the average maximum height of the tallest dominant trees for a given site class.

  Intermittent streams are defined as any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria.

> Including intermittent streams, springs, and wetlands within riparian management areas is important for full implementation of the Blue Mountains Aquatic and Riparian Conservation Strategy. Accurate identification of these features is critical to the correct implementation of the strategy and protection of the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. Fish-bearing intermittent streams are distinguished from non-fish-bearing intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams, or travel routes for fish emigrating from lakes. In these instances, the guidelines for fish-bearing streams would apply to those sections of the intermittent stream used by the fish.

Note: Riparian management area widths may only be adjusted based on a watershed analysis.

Key and Priority Watersheds

Definition and Purpose

Key watersheds are intended as areas that either provide, or are expected to provide, high-quality habitat or water for rare aquatic and riparian species, provide high-quality drinking water to communities that depend upon Forest Service watersheds as their municipal water sources, or both.

For the purpose of selecting key watersheds, rare species include threatened or endangered fish and wildlife species and species of conservation concern. Therefore, key watersheds may also be designated based upon the presence of high-quality habitat for these species. Key watersheds complement the management direction provided by other Blue Mountains Aquatic and Riparian Conservation Strategy elements and plan components because they are identified to support fish and water quality recovery plans but also because they are selected based on a ranking system that is in turn based on an assessment of watershed conditions, habitat conditions, population status, and restoration potential.

Key watersheds provide a network of refugia at the evolutionary significant unit, recovery unit, or population scale. A network of key watersheds, managed to serve as refugia, is crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species (FEMAT 1993). Refugia include areas of high-quality habitat as well as areas of degraded habitat that have high potential to develop into productive habitat. The network is designed to provide species level conservation and restoration of habitat conditions to retain strong/anchor populations of fish species of interest and species of concern in the short term, and contribute to recovery in the long term. In the short term, key watersheds provide centers of fully functioning, high-quality, aquatic and riparian habitat and a starting point for longer-term expansion of such habitats. Key watersheds with high-quality habitat will serve as anchors for the potential, near-term recovery of depressed stocks. The relative contribution to long-term conservation and recovery provided by the key watershed network will vary depending on species, habitat, life history requirements as well as the quality and extent of habitat existing within National Forest System lands. Watersheds containing lower quality habitat with high potential for restoration are expected to become future sources of high-quality habitat with the implementation of a comprehensive restoration.

Watersheds that act as sources of high quality water were considered in the selection of key watersheds. Among these are watersheds that are sources of cold water to downstream watersheds and watersheds that are sources of water for domestic use. In the revised forest plans, municipal

watersheds are designated as management areas in which the primary emphasis is the protection of water quality for human use and management actions are subject to the terms of the agreements that established each individual municipal watershed. Four cities in the Blue Mountains (Baker City, La Grande, Canyon City, and Walla Walla) have designated municipal watersheds. In addition, several cities (Richland, Long Creek, Sumpter, Joseph, Pendleton, and Prairie City) have water sources within watersheds on the national forests designated as public source watersheds by the State of Oregon, and several more have either surface or groundwater sources on National Forest System lands as their primary source of drinking water. Protection of all public water supplies is guided by both State and Federal law under the Safe Drinking Water and Clean Water Acts. While these watersheds generally have good water quality and watershed conditions, they may or may not possess the riparian and aquatic habitat, population criteria, or restoration potential that qualifies them as key watersheds. Table 1 displays municipal and public source watersheds identified in the forest plans and those that have been identified as key watersheds.

Table 1. Municipal and public source watersheds on National Forest System lands in the Blue Mountains

City	Watershed	Key Watershed?	Management
Baker City	Salmon Creek	No	Roadless
La Grande	Beaver Creek	No	Roadless
Canyon City	Byrum Gulch	No	Strawberry Wilderness
Walla Walla	Mill Creek	Yes	Roadless
Pendleton	N. Fork Umatilla	Yes	N.F. Umatilla Wilderness
Sumpter	McCully Creek	No	Public Source Watershed (OR)
Richland	Eagle Creek	No	Public Source Watershed (OR)
Joseph	Wallowa Lake	Yes	Public Source Watershed (OR)
Long Creek	Upper Long Creek	No	Not designated
Prairie City	Dixie Meadows	No	Public Source Watershed (OR)

While key watersheds are designed primarily to provide high-quality habitat for aquatic species, other aquatic or riparian and upland species also benefit from the key watershed network. Management direction in key watersheds is intended to provide the highest relative level of protection and the lowest relative level of risk from activities threatening their integrity and resiliency. The location of key watersheds relative to one another is important. Key watersheds are intended to be positioned so they form the centers of broadly connected networks of high-quality watersheds and restore currently fragmented habitats and core conservation fish populations. However, because key watersheds are only identified on National Forest System lands, the ability to connect adjacent habitats and watersheds is also dependent on the location of ownership boundaries, which were largely set at the time the national forests were established. In some cases, and depending on downstream land and water uses, this may result in limited ability to connect habitats for aquatic species, or that connection is still possible, but habitats downstream of the national forests may be in poor condition, have limited restoration potential, or both.

Key watersheds are complemented by other land conservation and restoration designations, such as wilderness, recommended wilderness areas, backcountry areas, inventoried roadless areas, and wild and scenic rivers, forming a network of areas with a passive management emphasis.

Identifying key watersheds adjacent to or surrounding these areas often provides the most favorable opportunities for providing connected networks of high quality and/or restorable habitats. These networks can then provide for the resiliency of aquatic, terrestrial, and riparian-dependent species to the maximum extent practicable within the capability of the national forests.

Research supports managing important watersheds more conservatively in terms of future risk and restoration. Conservation of meta-populations requires numerous patches of suitable habitat over time and the potential for dispersal among patches (Harrison 1994). Where there is currently an insufficient number of high-quality habitat patches, it is important to protect existing high-quality patches in the near term (Frissell 1997). Minimizing or eliminating external threats increases the likelihood of persistence of high quality patches (Carroll and Meffe 1997). These areas will serve as sources of individuals to colonize new patches as they develop favorable habitat. Development of future patches of favorable habitat requires the protection or restoration of critical ecological processes creating favorable habitat over time (Carroll and Meffe 1997).

Key Watershed Network Identification

For the most part, the process for identifying key watersheds follows the methods outlined in Reiss, et al. 2008. The principal difference is that habitat conditions received more consideration in the selection process in the Blue Mountains than is described in Reiss et al. (2008). In the Blue Mountains, key watersheds have a combination of relative population strength for one of four aquatic surrogate species (Chinook salmon, steelhead, inland redband trout, and bull trout), good watershed conditions, and good aquatic and riparian habitat condition. Watersheds that represent various environmental gradients were part of the selection criteria, under the assumption that environmental variation is a useful surrogate for ecosystem and species diversity and sustainability. Key watersheds are less likely to be affected by past land uses and more likely to be important to the maintenance of water quality and quantity for a variety of downstream uses, including human uses. Key watersheds are expected to be managed so that risk to aquatic and riparian habitats is minimized. Key watersheds are identified at the subwatershed level and consist of areas averaging 20,000 acres in the Blue Mountains.

The four surrogate species selected for analysis in the Blue Mountains were selected in part because information on their status and distribution is available. As a group, these four species occupy habitats that encompass nearly the full extent of aquatic habitats on the three national forests in the Blue Mountains. Steelhead and Chinook salmon are extinct upstream of Hells Canyon Dam and thus are absent from their former range in the Powder, Burnt and Malheur rivers. Remnant populations of resident inland redband trout persist in these basins. Resident redband trout likely also exist within the present range of anadromous steelhead in the John Day, Umatilla, Walla Walla, Tucanannon, Grande Ronde and Imnaha rivers, but to our knowledge there aren’t data that would distinguish between anadromous and resident redband populations in these basins. None of the four selected surrogate species occupies the full extent of their former habitat in the Blue Mountains, based on available data.

Aquatic ecological condition within individual subwatersheds were assessed using a decision support model by analyzing surrogate species status and watershed conditions in combination (figure 7). Surrogate species status and condition were determined by assessing: 1) Species distribution, 2) population status, 3) connectivity, and 4) the effects of non-native species. Watershed conditions were assessed by a combination of roads and related effects, and the condition of terrestrial and riparian vegetation. Key watersheds are identified that have a combination of strong populations for one or more surrogate species and good habitat conditions. Key watersheds are identified at the subwatershed scale, and in some cases, may consist of

groups of subwatersheds. The selection process follows Reiss et al. (2008) with minor modifications.

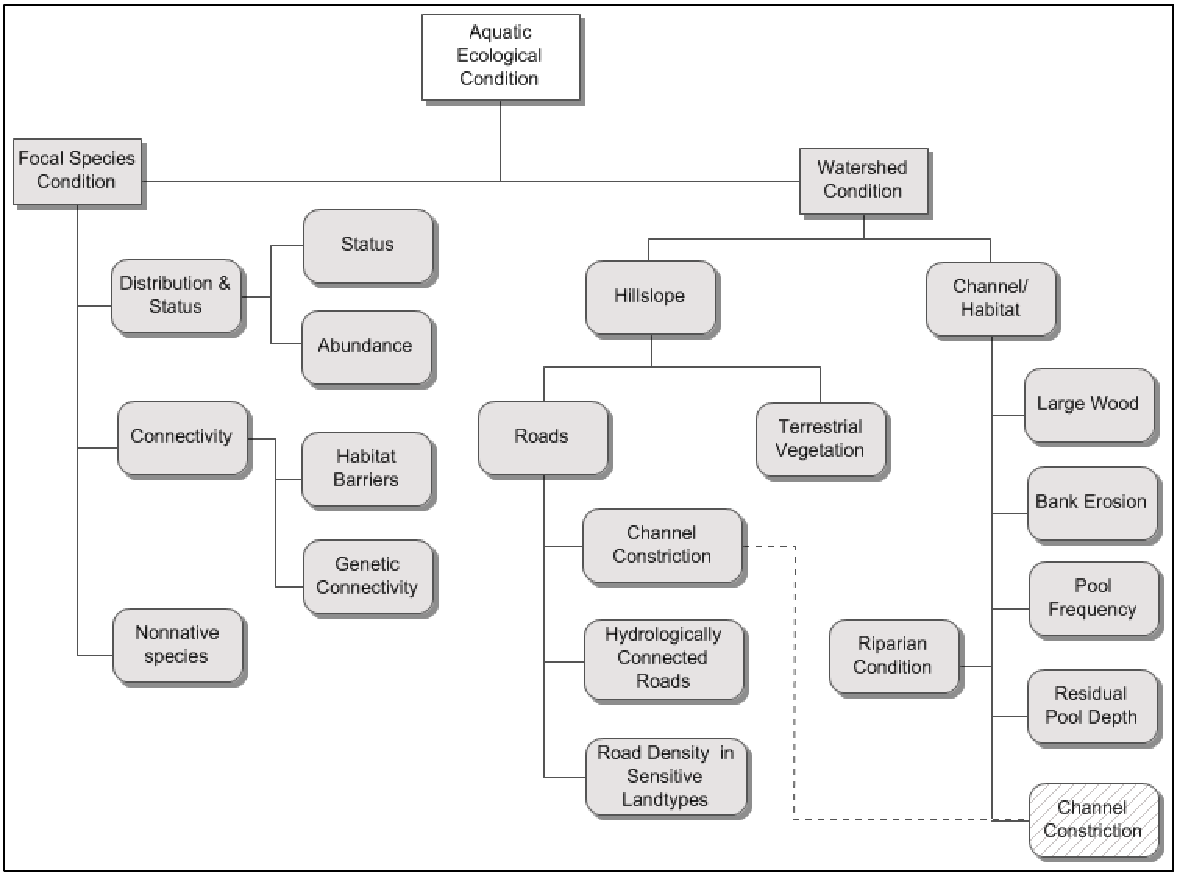

Figure 7. Basic decision structure for determining aquatic ecological condition of watersheds in the Blue Mountains (modified from Reiss et al. 2008)

Model output scores for population status, watershed condition, and aquatic habitat condition were tabulated by subwatershed and combined to arrive at a total subwatershed score, then ranked in descending order. Subwatersheds were ranked by location: 1) for the Blue Mountains, 2) by national forest, and 3) by subbasin.

In watersheds with multiple species, subwatersheds were ranked based on the highest species score, as opposed to combining the scores of multiple species, based on the finding that combining multiple species scores de-emphasized habitat values in the ranking. Using the highest species score tended to level out the relative weights of habitat and population strength. Combining population scores for individual hydrologic unit code watersheds also tended to favor anadromous species (but in very few hydrologic unit code watersheds) over watersheds that provided habitat for a single, usually resident, fish species (inland redband). This adjustment did not eliminate watersheds providing habitat for anadromous fish as key watersheds, but served to extend the key watershed network to watersheds that are known to provide habitat only for resident fish. Key watersheds with multiple species were considered to have higher priority for restoration.

An initial model run, using forested vegetation departure, road density and surrogate species status was used in the initial selection of key watersheds. This method identified roughly two-

thirds of the restoration priorities identified by the Malheur, Umatilla and Wallowa-Whitman National Forests (USDA Forest Service 2001, 2002, 2005).

Subsequent iterations of key watershed selection were based on expectations of recovery plan goals, critical habitat designation, and expected partner agency interest in watershed-scale restoration. The first iteration of key watershed selection occurred in late 2008 and several modifications were made to the key watershed network between mid-2009 and March 2010. Restoration priorities were chosen between March and June 2010. Review and modification of the key and priority watersheds has occurred intermittently since 2010 as ongoing restoration work.

Population status by subwatershed was determined using a set of criteria, developed by the Inland West Watershed Initiative (IWWI) (USDA Forest Service 1997), which identified strong versus depressed population or metapopulation conditions in the subwatershed. Each stream segment was assigned one of eight categories, depending on the amount of data and information available. These categories were present strong, not strong but key habitat feature, present depressed, present migration corridor, present unknown status, absent, unknown, and extinct.

"Strong" populations were identified as having all of the following characteristics: (1) stable numbers or are increasing; (2) all major life history forms that historically occurred within the subwatershed are present; (3) the local population is likely to be half or more of its historic size or density; and (4) the local population in the subwatershed or the metapopulation in the larger region of which the local population is a part of is likely to be at least 5,000 individuals or 500 adults. The local population is not isolated by distance or natural barriers from other local populations that would collectively exceed these numbers.

"Depressed" conditions were identified as depressed population for native species (defined for use in the Blue Mountains aquatic sustainability model) as having one or more of the following characteristics: (1) one or more life histories formerly present are absent (example migratory or resident form of bull trout); (2) population numbers are declining or less than half of historic numbers or the population occupies less than half of its historic habitat in the subwatershed; or (3) the local population in the subwatershed or the metapopulation in the larger region of which it is a part of is less than 5,000 individuals or 500 adults (the local population is isolated by distance or natural barriers from other populations which would collectively exceed these numbers). If historic information is not available, population densities are less than half of comparable undegraded subwatersheds where the surrogate species is well distributed. If numbers are strong but the surrogate population is seriously hybridized with non-native species, the pure native population of the surrogate species is considered depressed.

Additional categories identified the presence of migration corridors, whether species are considered extinct, absent, or their presence is unknown. Subwatersheds that did not have strong populations, but contained one or more key habitat characteristics important to the sustainability of the species (spawning habitat, cold water refugia, critical habitat) on National Forest System lands were assigned the "not strong but key habitat feature". Watersheds identified as having important habitat features are also tagged for use in the habitat portion of the model. In some cases, the identified habitat feature may be the only habitat available to a local population.

Based on available information, only 17 of 550 subwatersheds on the three national forests were identified as having strong populations using this definition. The only surrogate species for which strong populations are believed to be present are bull trout. However, there may be populations of other surrogate species that occupy areas larger than an individual subwatershed that might be considered "strong" using a different definition. The resulting maps display relative population

strength and distribution for each of the four surrogate species, based on a combination of local knowledge and available aquatic inventory data.

Watershed conditions were assessed as a function of the degree of: 1) alteration of terrestrial vegetation from reference conditions, including the resulting change in fire regime; 2) the extent of the road network and the resulting effects on hydrology, erosion and sedimentation, channel constriction; and 3) the status of riparian plant communities.

Watersheds identified as key watersheds within National Forest System lands, with few exceptions, possess the best remaining habitat and strongest fish populations in the Blue Mountains. One of the most notable exceptions occurs on the Umatilla River and results from efforts by the Confederated Tribes of the Umatilla Indian Reservation to restore habitat conditions for anadromous fish species and the reintroduction of coho salmon.

Watersheds with the highest potential for restoration were identified and ranked within each subbasin and on each national forest. These are watersheds having the highest potential to connect existing high-quality habitats or replace existing habitats as conditions change over time. They are generally located adjacent to or downstream from the watersheds identified above and serve to extend or connect existing high-quality habitats.

Watersheds were also identified in which watershed restoration is ongoing or being planned and where a substantial part of the work will be off-forest or where planned restoration is expected to be conducted by an agency or partner other than the Forest Service. A few watersheds in which active partnerships and investment in restoration has or will occur have not been identified as key watersheds but still recognize the interests of active partners in watershed and habitat restoration. In these watersheds, restoration actions on National Forest System lands will complement restoration activities outside National Forest System lands. In several cases, these watersheds are, or will be, the highest priorities for restoration on the national forests.

Priority Watersheds for Restoration

Using the process described above 209 subwatersheds are named as key watersheds, of which 70 are considered priorities for restoration (figure 9). Priority watersheds identified here, are either sites where watershed and habitat restoration is ongoing, where restoration work is planned, but has not yet commenced, or is expected to occur in the next 10 to 15 years.

In 2011, the Watershed Condition Framework (USDA Forest Service 2011) was instituted to provide a nationally consistent approach to 1) assess watershed conditions, 2) prioritize watersheds for restoration, 3) develop restoration plans, 4) implement needed restoration, 5) track restoration accomplishments, and 6) monitor and verify the effectiveness completed restoration (figure 8).

Under this approach, each national forest is expected to select two to three subwatersheds for restoration that can be completed in the next five years. The process is repeated at five-year intervals, resulting in a new set of priorities for restoration and the completion of restoration work following the six steps described above. The intent of the process is to accelerate the pace of needed watershed restoration while improving communications with partner agencies and providing a mechanism for tracking implementation and the effectiveness of completed work.

Definition and Purpose of Watershed Condition Framework Priority Watersheds

The number of Watershed Condition Framework priority watersheds will vary by national forest but is expected to range from one to five, given current funding levels. The framework, which includes identification of priority watersheds, is summarized in figure 8 and described in detail in section 10.

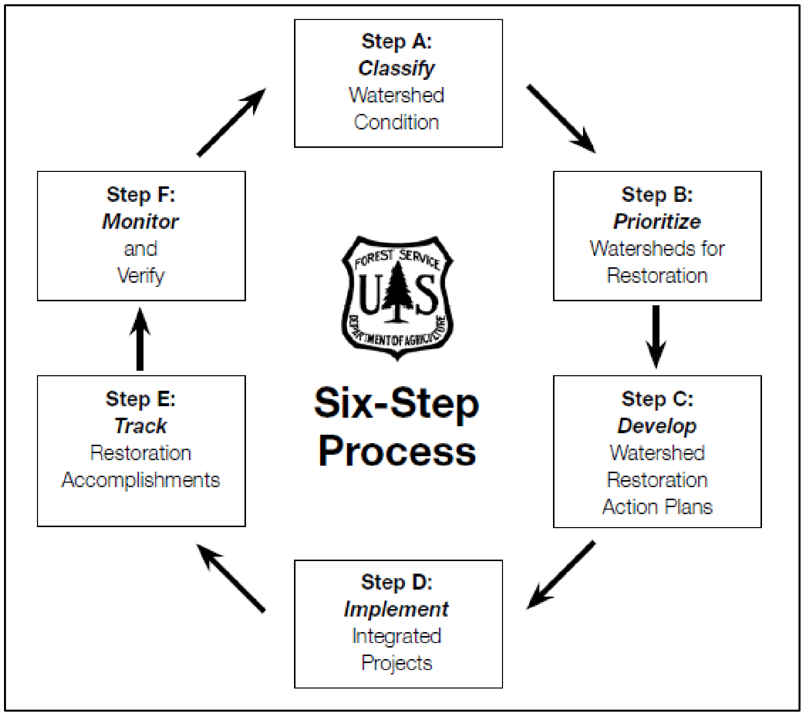

Figure 8. Watershed condition framework, a 6-step process for watershed restoration

Priority watersheds are the 12-digit hydrologic units (subwatersheds or hydrologic unit code 12) in which near-term (for example, 5 to 7 years) restoration programs and resources will be focused. Selection of these subwatersheds will be based on several criteria, as described in the following sections. Priority watersheds will generally be a subset of the broader, longer-term key watershed network and associated potential Watershed Condition Framework priority watersheds.

Designating Watershed Condition Framework Priority Watersheds

The responsible official will continue to select Watershed Condition Framework priority watersheds based on an interdisciplinary analysis and evaluation. In addition, the responsible official will reach out to local, State, Tribal, other Federal agencies, and interest groups when identifying priority watersheds (Forest Service Handbook 1909.12, chapter 20, section 22.31).

Criteria for selection include:

- the value of the watershed from a water/aquatic resource perspective
- existing watershed, water quality, and aquatic habitat conditions
- key watershed status
- alignment with other strategic objectives or priorities at national, regional, or local levels

- alignment with priorities of other agencies and potential partners
- estimated costs and unit work capacity
- technical, financial, and social opportunities and constraints

Priorities will generally focus on those watersheds that are in good to fair condition but still require some restoration. This approach, consistent with principals of conservation biology (FEMAT 1993, Roni et al. 2002), will enable watersheds to be restored with reasonable investments of time and funding. As with key watersheds, the potential effects of climate change and the efficacy of restoration treatments in ameliorating those and other effects (for example, land use) should be considered in the selection of Watershed Condition Framework priority watersheds and subsequent identification of the scope and scale of needed restoration work.

Priority Watersheds

The present set of key and priority watersheds are displayed by national forest in attachment A, table 9 through table 11 and in figure 9. Watershed boundaries, unit codes, and names are from the current national hydrologic data set. There are 170 watersheds identified as key watersheds in the three National Forests. These key watersheds are located in 19 of the 22 subbasins that include National Forest System lands in the Blue Mountains. Key watersheds comprise 947,000 acres, or 57 percent of the area of the Malheur National Forest; 800,000 acres, or 57 percent of forest area in the Umatilla National Forest; and, 1,270,000 acres or 71 percent of national forest area in the Wallowa-Whitman National Forest. From this set of key watersheds, 70 are identified as priorities for restoration, of which 27 are within the Malheur National Forest, 16 are within the Umatilla National Forest, and 27 are within the Wallowa-Whitman National Forest. Priority Watersheds occupy 430,000 acres (25 percent) of the Malheur National Forest, 260,000 acres (19 percent) of the Umatilla National Forest and 325,500 acres (18 percent) of the Wallowa-Whitman National Forest.

The Watershed Condition Framework process has resulted in the selection of 10 subwatersheds as priorities for restoration over the 5-year period beginning in 2011. All 10 had been previously selected as key watersheds and 9 of 10 were identified as restoration priorities.

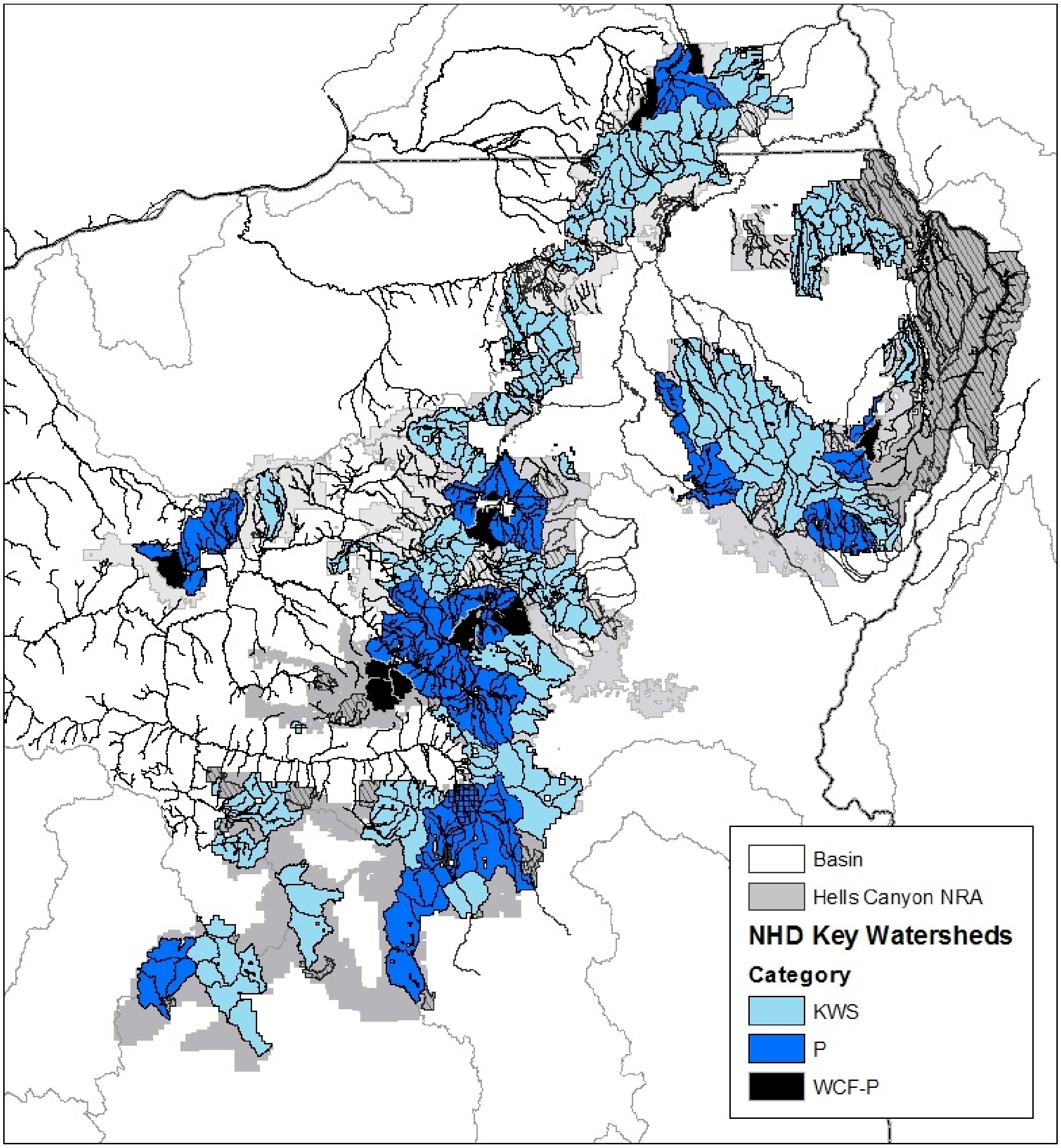

Figure 9. Map of key watersheds on national forests of the Blue Mountains. KWS = Key Watershed, P= Priority Watersheds, WCF-P= Watershed Condition Framework Priority Watersheds. Stream lines display critical habitat for Chinook salmon, steelhead, and bull trout (undifferentiated by species). Crosshatched areas are roadless or designated wilderness areas.

Relationship with Key Watershed Network

The key watershed network serves as a broad-scale, long-term (multiple decades or more) strategic network of watersheds focused on the conservation and restoration of aquatic and riparian ecosystems and water quality. Priority watersheds are a subset of the key watersheds with the intention of prioritizing restoration in the plan period (15 years). Priority watersheds are yet another subset of watersheds generally chosen from the set of priority watersheds, wherein near-term (approximately 5 years) restoration actions are focused. The key watershed network and priority watersheds are expected to remain relatively unchanged during the life of the forest plan, whereas priority watersheds are expected to change fairly frequently (for example, perhaps as

frequently as every couple of years), depending on the scope of needed restoration work and the pace of implementation.

This approach will continue to be used by the national forests to achieve the long-term strategic goals (desired conditions) of the forest plans, while facilitating near-term restoration planning and implementation at a finer spatial scale.

Changing Priority Watersheds

Updates to the priority watersheds may be made by administrative change at any time. It is expected that restoration priorities will change over time, depending on changed conditions, disturbance (including fires and flood events), changes in available funding, or changes in the priorities of partner agencies. The Watershed Condition Framework process is expected to be repeated at roughly 5-year intervals so there are always near-term (approximately 5 years) and longer-term (10 to 15 year) restoration goals. The process allows restoration priorities outside of the key and priority watershed network if circumstances warrant and with public notification of the change (36 CFR 219.8(f)).

6. The Blue Mountains Aquatic and Riparian Conservation Strategy and Forest Plans

During the length of time this planning effort has been underway (2003-Present), there have been several attempts to revise the Planning Rule. Presently, the 2012 Planning Rule is in place; however, in that Planning Rule there is transition language (36 CFR 219.17 (b) (3), that allows planning efforts already underway to use the prior planning regulation, which in this case is the 1982 Planning Rule. Definitions for plan components and other plan content use in the Blue Mountains strategy, are derived from both the 1982 (36 CFR 219.3) and 2012 Planning Rules (36 CFR 219.7). Some of the concepts were not in place in 1982; where there are not equivalent definitions in the 1982 Planning Rule, the 2012 Planning Rule has been included. Additionally, the 2012 Planning Rule requires all forest plans to comply with the new rule. Therefore, the structure of the monitoring plan and reference to requirements come directly from the 2012 Planning Rule.

Elements of the Blue Mountains Aquatic and Riparian Conservation Strategy will be incorporated into a suite of plan components by:

- setting goals and desired conditions;
- identifying suitable uses or activities that are or are not generally appropriate in certain management areas;
- describing anticipated outputs in the form of objectives that are a means to measure progress towards achieving or maintaining desired conditions;
- constraining activities with standards or guidelines that ensure protection of physical and biological resources; and
- conducting monitoring and evaluation that will provide a basis for a periodic determination and evaluation of the effects of management practices.

Each part of the strategy and its means of implementation are important. However, these individual elements should not be viewed in isolation, as all parts of the strategy, the plan and other plan content work together to guide and constrain management to achieve the desired

conditions. Details regarding how they will be used to implement the Blue Mountains Aquatic and Riparian Conservation Strategy are provided in sections 6 through 11.

Multiple plan components will be used to implement the Blue Mountains Aquatic and Riparian Conservation Strategy via forest plans, as described in this section. These plan components include desired conditions, management areas, suitability, objectives, and standards and guidelines, as defined in section 7. Other plan content (for example, watershed analysis, restoration, monitoring and adaptive management) will be equally important in implementing the Blue Mountains strategy.

Projects and activities authorized after approval of the revised forest plans must be consistent with the applicable plan components. A project or activity approval document must describe how the project or activity is consistent with applicable plan components and meets the following criteria:

- **Goals, desired conditions, and objectives**. The project or activity contributes to the maintenance or attainment of one or more goals, desired conditions, or objectives, and does not appreciably impede progress toward maintaining or achieving any goals, desired conditions, or objectives, over the life of the plan.
    - ♦ **Standards**. The project or activity complies with applicable standards
    - ♦ **Guidelines**. The project or activity:
        - ▪ Complies with applicable guidelines as set out in the plan; or
        - ▪ Is designed in a way that is as effective in achieving the purpose of the applicable guidelines (section 219.7(e)(1)(iv))
    - ♦ **Suitability.** A project or activity would occur in an area:
        - ▪ the plan identifies as suitable for that type of project or activity; or
        - ▪ for which the plan is silent with respect to its suitability for that type of project or activity.

It is not expected that all projects or activities will contribute to all desired conditions and objectives. It should also be recognized that some projects designed to contribute to some desired conditions and objectives may have consequences considered adverse to the achievement of other desired conditions and objectives. In this situation, the responsible official needs to identify and disclose those effects and determine whether those effects will appreciably reduce the opportunity to maintain or achieve any goals, desired conditions, or objectives, over the life of the plan. If the project or activity is found to appreciably reduce opportunities to maintain or achieve any goals, desired conditions, or objectives over the long term, it is not consistent with the forest plan.

Where a project or activity is proposed that is not consistent with the plan, the responsible official has the following options:

- modify the proposal so that the project or activity will be consistent
- reject the proposal
- amend the plan simultaneously with the approval of the project or activity so that the project or activity is consistent with the plan as amended. The amendment may be limited to apply only to the project or activity.

Goals and Desired Conditions

Definitions:

- 36 CFR 219.3 (1982) Definitions and terminology. ***Goal.*** A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed.
- 36 CFR 219.7 (i) (2012) ***Desired conditions***. A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined, but do not include completion dates.

Goal statements set forth a broad framework and theme for the plan and form the basis for desired conditions. For each goal, there are several desired condition statements that more specifically describe what conditions are needed for attaining goals. Desired conditions are at the heart of forest plans. They describe the aspirations or visions of what the plan area (or portions thereof) should look like in the future. Desired conditions essentially set forth the desired landscape of the future. They also provide the foundation and drive the development of most other plan components. For example, the forest plan includes objectives, standards, and guidelines that are designed to achieve or maintain desired conditions.

To be consistent with the desired conditions of the plan in assessing a project or activity, at the appropriate spatial scale described in the plan (for example, landscape scale), each project or activity must be designed to meet one or more of the following conditions:

- maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions
- be neutral with regard to progress toward plan desired conditions, except as specified in standards or guidelines
- maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short term
- maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long term

The project documentation should explain how the project is consistent with desired conditions and describe any short-term or negligible long-term adverse effects the project may have on the maintenance or attainment of any desired condition.

Achieving desired conditions will vary in both time and space. Some desired conditions may not be achievable over the life of the plan and may take decades or sometimes longer due to past anthropogenic influences. In other cases, the desired condition already matches the current condition, and the desire is to maintain it. In addition, each desired condition has a scale. Some desired conditions apply at the forestwide scale, while others apply at a subbasin, watershed, subwatershed, or management area scales.

In the plan, a brief background description and a brief existing condition description of each desired condition are provided, followed by the desired condition and statement of scale. The

background and existing condition descriptions are provided for information only. They are not plan direction.

General Forestwide Desired Conditions

The general forestwide desired conditions described in this section apply at larger (for example, watershed) scales, not at particular sites. The national hydrologic unit is the basis for defining the specific scales at which the general forestwide desired conditions apply. The three watershed scales most relevant to implementation of the forest plan are subbasin (8-digit hydrologic unit), watershed (10-digit hydrologic unit), and subwatershed (12-digit hydrologic unit). Individual project assessments often use data collected at finer scales such as the subwatershed, drainage, valley segment, site, stream reach or scale.

Forestwide desired conditions pertaining to riparian areas, water, water quantity and quality are described below. The scale(s) at which these generally apply to forest planning and project planning are identified after each desired condition.

Watershed Function DC-1. The watershed-scale processes that control the routing of water, sediment, wood, and organic material operate at levels that support native aquatic species and the proper function of their habitat and do not require human intervention or restoration.
Scale: watershed or subwatershed.

Watershed Function DC-2. The distribution, diversity, and complexity of watershed features (submerged and overhanging large wood, logjams, and beaver dams, side channels, pools, undercut banks and embedded substrates) and natural processes provide aquatic and riparian ecosystems to which species, populations, and communities are uniquely adapted.
Scale: subbasin.

Watershed Function DC-3. Connectivity exists within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide unobstructed routes to areas critical for fulfilling all life history requirements of aquatic, riparian-dependent, and upland species of plants and animals.
Scale: Connectivity is within and between watersheds at the subbasin scale for forestwide planning; between subwatersheds at the watershed scale for project planning.

Watershed Function DC-4. Aquatic and riparian ecosystems resilient to the effects of climate change and other major disturbances.
Scale: subbasin for forest planning and watershed scale for project planning.

Hydrologic Function DC-1. Flow regimes, including water yield, timing, frequency, magnitude, and duration of runoff, are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of movement of sediment, nutrients, and wood. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are within the natural range of variability in which the system developed.
Scale: watershed.

Hydrologic Function DC-2. The timing, variability, and duration of floodplain inundation, water table elevation in wetlands, seeps, and springs, and subsurface water connectivity are within the natural range of variability.
Scale: watershed and subwatershed.

Wetland DC-1. The extent and diversity of wetland types is maintained or increased.
Scale: subbasin.

Wetland DC-2. The surface and subsurface flow paths that support wetland habitats are undisturbed. The timing and duration of inundation of wetlands are within natural ranges. Plant species composition in wetlands is characteristic of the biophysical setting in which they occur.
Scale: subwatershed.

Groundwater-dependent Ecosystem DC-1. The ecological structure and function of springs, peatlands and groundwater fed wetlands are maintained or restored.
Scale: subwatershed.

Groundwater-dependent Ecosystem DC-2. The aquifer supplying water to groundwater-dependent ecosystems is not being affected by groundwater withdrawal or loss of recharge. Soils of groundwater dependent ecosystems are intact and functional; erosion and deposition are within the natural range. Runout channels, if present, are functioning naturally and are not entrenched, eroded, or substantially altered. Vegetation is composed of the anticipated cover of plant species associated with the site environment; hydric species are present and are not replaced by upland species. Livestock herbivory and trampling are not adversely affecting sites.
Scale: subwatershed.

Groundwater-dependent Ecosystem DC-3. Vegetation is composed of the expected cover of plant species associated with the site environment; hydric species are present and are not replaced by upland species. Livestock herbivory and trampling are not adversely affecting sites.
Scale: subwatershed.

Stream Channel Function DC-1. The sediment regime under which aquatic ecosystems evolved is maintained, including the timing, volume, rate and character of input, storage, and transport.
Scale: watershed.

Stream Channel Function-2. The physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, are properly functioning and in dynamic equilibrium with the flow and sediment regimes under which aquatic systems have evolved.
Scale: subwatershed to watershed.

Stream Channel Function DC-3. Channel morphology, structure, complexity, and diversity are in ranges that are characteristic of the local geology, climate, and geologic processes.
Scale: watershed.

Stream Channel Function DC-4. Channel-floodplain connections are intact. Channel bed and bank erosion rates are within natural ranges and do not result in degraded aquatic or riparian habitats or channel alteration.
Scale: subwatershed to subbasin.

Stream Channel Function DC-5. Measures of channel stability and morphology, including width/depth ratio, bank stability, and bank angle are within reference ranges and matches the frequency distribution of reference sites for a given channel type and channel size.
Scale: subwatershed to subbasin.

Stream Channel Function DC-6. Large wood frequency and volume are within the range of variation and potential for streams in individual watersheds. The spatial and temporal distribution of wood in individual streams varies depending on valley, riparian, and channel characteristics and the disturbance processes (fire, flood, debris flow) responsible for transferring material from

hillslopes to streams. The frequency distribution of large wood among individual streams is similar to the frequency distribution of reference sites.
Scale: watershed.

Stream Channel Function DC-7: In forested watersheds, the distribution and frequency of wood forced channel morphology (forced step pool and forced pool riffle streams), in which the majority of pools are formed by individual pieces or accumulations of large wood, and wood-rich pool riffle streams (Montgomery et al. 1995) is comparable to the distribution in reference watersheds.
Scale: watershed.

Stream Channel Function DC-8: The frequency distribution of stream channel and habitat conditions for any given attribute approaches the frequency distribution of reference conditions for the same attribute in similar channel types.
Scale: watershed to subbasin.

Stream Channel Function DC-9: Pool frequency, size, depth, and volume are within ranges expected of given channel and valley types.
Scale: subwatershed to watershed.

Stream Channel Function DC-10: Bank erosion is within a range that does not degrade aquatic or riparian habitats or that leads to channel alteration.
Scale: subwatershed to subbasin.

Aquatic Function DC-1. Aquatic habitats contribute to ecological conditions capable of supporting self-sustaining populations of native species and diverse plant, invertebrate, and vertebrate aquatic and riparian-dependent species. Aquatic habitats are key for the recovery of threatened and endangered fish species and provide important habitat components for all native aquatic species.
Scale: subwatershed to subbasin.

Aquatic Function DC-2. National Forest System lands contribute to the protection of population strongholds for state classified sensitive species, and narrow endemics, federally listed or proposed threatened and endangered species, and designated critical habitats. These strongholds provide high quality habitat (for example, spawning, rearing, and over-wintering areas and critical habitats, including migratory corridors) and support expansion and re-colonization of species to adjacent watersheds, and function in a manner that is resilient to natural disturbance regimes. These areas conserve key demographic processes likely to influence the persistence of populations or metapopulations. Areas adjacent to these high quality habitats are restored (as appropriate) and protected to help ensure adequate connectivity, species distribution, and the maintenance or restoration of fully functioning habitats for all life histories of aquatic species.
Scale: subwatershed to subbasin.

Aquatic Function DC-3. Aquatic habitat elements (e.g., substrate, pools, cover, food, water quality and quantity) are in properly functioning and are sufficiently distributed to ensure egg and embryo survival, fry emergence, and juvenile survival of aquatic species to support self-sustaining populations of native resident and anadromous fish. Spawning and rearing areas contain a minimal amount of fine sediment, ranging in size from silt to coarse sand.
Scale: subwatershed to subbasin.

Aquatic Function DC-4. Native fish species have access to historically occupied aquatic habitats and connectivity between habitats allows for the interaction of local populations. Migratory

habitats support juvenile and adult mobility and survival between spawning, rearing, overwintering, and foraging habitats that contain areas that:

- are free of obstruction and excessive levels of predators of federally listed aquatic species;
- have minimal physical, biological, or water quality and quantity impediments (including permanent, partial, intermittent, or seasonal barriers); and
- contain natural cover such as large wood, aquatic vegetation, rocks and boulders, side channels, and undercut banks.

Scale: subwatershed to subbasin.

Aquatic Function DC-5. The transfer of wood, sediment, nutrients, and other material that occurs following fires, wind storms, floods, and other natural disturbances is capable of creating and maintaining the range and diversity of riparian and aquatic habitat conditions that occurs in reference watersheds.
Scale: watershed.

Aquatic Function DC-6. The potential for large wood recruitment to streams from within forested riparian areas, and from low-order streams to higher-order streams, is similar to the potential in reference watersheds containing the same (riparian) forest vegetation types (this partly restates WF-1 but is more explicit).
Scale: watershed.

Aquatic Function DC-7. Aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths, size and frequencies, channel morphology, large woody debris size and frequency) in the population of watersheds on the national forest is similar to the distribution of conditions in the population of similar, reference condition watersheds. The distribution of conditions in individual streams vary depending on valley, riparian, and channel characteristics.
Scale: reference conditions can be drawn from the national forest or provincial scales; conditions assessed at the subbasin scale for national forest and project planning.

Aquatic Function DC-8. Aquatic and riparian ecosystems are resilient to the effects of climate change and other major disturbances.
Scale: subbasin scale for national forest planning and watershed scale for project planning.

Species Diversity DC-1. The natural range of habitats for native and desired nonnative fish, wildlife, and plant species, including threatened and endangered species, species identified as regional forester's sensitive species, and surrogate species, is of adequate quality, distribution, and abundance to contribute to maintaining native and desired nonnative species diversity. This includes the ability of species and individuals to interact, disperse, and find security within habitats in the planning area. These habitat conditions are resilient and sustainable considering the range of possible climate change scenarios.
Scale: The desired condition for species diversity can be applied at a variety of scales (forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections.

Species Diversity DC-2. Population strongholds for the fish surrogate species provide high quality habitat and support expansion and recolonization of species to adjacent unoccupied habitats. These areas conserve key demographic processes likely to influence the sustainability of aquatic species.
Scale: The desired condition for species diversity can be applied at a variety of scales (forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections.

Species Diversity DC-3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish exist. Low levels of occurrence of nonnative predatory, interbreeding, or competing species exist, and if present, they are temporally and spatially isolated from federally listed species.
Scale: The desired condition for species diversity can be applied at a variety of scales (forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections.

Species Diversity DC-4. Specialized habitat components, such as caves, standing dead trees, seeps, and springs, are found across the landscape in amounts and types commensurate with the natural communities in which they occur.
Scale: The desired condition for species diversity can be applied at a variety of scales (forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections.

Species Diversity DC-5. Management activities improve the conservation status of species identified as being surrogate species or of local or regional conservation concern. Habitats and populations are managed in accordance with conservation planning documents, recovery plans, best available scientific information, and local knowledge.
Scale: The desired condition for species diversity can be applied at a variety of scales (forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections.

Federally Listed Species DC-1. Federally listed species (aquatic and terrestrial) are recovered or delisted. Management activities improve the conservation status of listed species and designated critical habitat. Habitats are managed in accordance with conservation planning documents, recovery plans, best available scientific information, and local knowledge. Critical habitat components (primary constituent elements and primary biological features) are protected and restored to achieve species recovery.

- For listed aquatic species, on National Forest System lands spawning, rearing, and migratory habitat is widely available and inhabited. Listed aquatic species have access to historic habitat and appropriate life history strategies (resident, fluvial, adfluvial, and anadromy) are supported. Recovery is promoted through cooperation and coordination with tribes, state agencies, federal agencies, and other interested groups.

- For listed terrestrial species, habitat that adequately provides ample resources for all life stages is available and inhabited. Recovery is promoted through cooperation and coordination with tribes, state agencies, federal agencies, and other interested groups.
- For listed plant species, threats such as invasions by aggressive, nonnative plants, adverse livestock grazing management, and changes in fire frequency and seasonality are addressed. Populations achieve recovery through cooperation and coordination with tribes, state agencies, federal agencies, and other interested groups.

Scale: A variety of spatial scales and hydrologic boundaries (ranging from individual projects to subwatersheds to areas as large as populations). Species recovery plans identify activities necessary for recovery at the project (reach), subwatershed and population scales. Species' recovery plans further describe high-priority restoration actions at these scales that address identified limiting factors and threats to listed species and designated critical habitats.

Invasive Species DC-1. Healthy, native and desired nonnative animal communities, and native and desired nonnative plant communities dominate the landscape and are resilient given current and projected climate conditions. Invasive species and other undesirable species (terrestrial and aquatic plants and animals) are absent or occur in small areas and have limited or no impacts on viability of native and desired nonnative species. Existing invasive and undesirable species do not expand their current distributions over the life of the plan, and their current distributions will be reduced to the extent possible over that period of time. Invasive and undesirable species do not significantly diminish the ability of the national forests to provide the goods and services communities expect or the habitat that plant and animal community diversity depends upon. New invasive species resulting from changes in plant and animal habitats due to changes in climate occur only at low levels.
Scale: watershed.

Water Use DC-1. Water is available in sufficient quantity and quality to meet downstream human needs as well as the needs of aquatic species considering the range of possible climate change scenarios.
Scale: watershed to subbasin.

Water Use DC-2. Water quality and quantity of groundwater resources, including seeps, springs, fens, and other groundwater-dependent ecosystems, is sufficient to provide for the extent and diversity of species associated with these habitats.
Scale: watershed to subbasin.

Water Quality DC-1. Water quality (for example, temperature, turbidity, and dissolved oxygen) of surface and groundwater is sufficient to support healthy riparian, aquatic, and wetland ecosystems. It is within the range that maintains the biological, physical, and chemical integrity of the system and is capable of benefiting the survival, growth, reproduction, and mobility of individuals composing aquatic and riparian communities.
Scale: watershed.

Water Quality DC-2. The quality of water within and emanating from the national forests is sufficient to provide for state-designated beneficial uses, including human uses and meets applicable local, state, and tribal water quality criteria.
Scale: subbasin.

Desired Conditions for Key Watersheds and Subwatersheds with Endangered Species Act Critical Habitat for Aquatic Species

Key Watershed DC-1. Connected networks of watersheds with ecological form, function, and processes and functionally intact ecosystems contribute to and enhance conservation and recovery of specific threatened or endangered fish species and provide high water quality and quantity. The networks contribute to short-term conservation and long-term recovery at the major population group, core area or other appropriate population scale.
Scale: watershed to subbasin.

Key Watershed DC-2. Roads in key watersheds present minimal risk to aquatic resources.
Scale: subwatershed.

Key Watershed DC-3. Key watersheds have high watershed integrity and provide resilient aquatic and riparian ecosystems.
Scale: subwatershed.

Desired Conditions for Riparian Management Areas

Riparian Management Area DC-1. Riparian management areas within any given watershed reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.
Scale: subwatershed.

Riparian Management DC-2. The species composition and structural diversity of native plant communities in riparian management areas, including wetlands, provides adequate side channels, pools, undercut banks and unembedded substrates. These conditions result in a variety of depths, gradients, velocities, and structure for seasonal thermal regulation, nutrient filtering, appropriate rates of erosion, and channel migration and supplies amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability.
Scale: Watershed scale for forestwide planning; subwatershed scale for project planning.

Riparian Management Area DC-3. Key riparian processes and conditions (including slope stability and associated vegetative root strength, bank stability, wood delivery to streams, and, within the riparian management areas, input of leafy and other organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistent with natural disturbance regimes.
Scale: subwatershed.

Riparian Management Area DC-4. Riparian vegetation has the species composition, structural diversity, age class diversity, and extent that is characteristic of the setting in which it occurs and the hydrologic and disturbance regimes in which it developed. The condition and composition of small habitat patches may change over small temporal and spatial scales but remains relatively constant at larger scales. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.
Scale: subwatershed to subbasin.

Riparian Management Area DC-5. Riparian shrub communities occupy their historical range and extent. Individual plants are capable of reaching the full potential for a typical individual of a particular species, as defined by plant height, width, and growth form. Individual plants are able to propagate or reproduce vegetatively, sexually, or both. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe

and Clausnitzer 1997) that are representative of a particular setting.
Scale: subwatershed.

Riparian Management Area DC-6. Riparian areas consist of native assemblages of riparian-dependent plants and animals free of persistent non-native species and provide for dispersal and travel corridors, as well as connectivity, between geographically important areas for both terrestrial and aquatic animals and plant species within the planning area.
Scale: subwatershed.

Riparian Management Area DC-7. The potential for large wood recruitment to streams from within forested riparian areas, and from low-order streams to higher order streams, is similar to the potential in reference watersheds with similar forest vegetation types.
Scale: watershed.

Objectives

Definition:

- 36 CFR 219.3 (1982) **Objective.** A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

The objectives represent some of the expected outcomes for the national forest to make progress towards desired conditions.

Objectives are projections of Forest Service activities and program outcomes that are measurable and time specific. Like goals and desired conditions, objectives are not commitments or final decisions approving projects or activities. They are an effort by the Forest Service to share with the public the way progress toward achieving or maintaining the desired conditions during the life of the plan will be measured. The objectives stated are only a partial list of the management activities expected to be accomplished to contribute to maintaining or achieving desired conditions.

Objectives are based on ecological needs, community capacity, and expected funding, including budgets, partnerships, and cooperative agreements. The actual accomplishments will be dependent on actual funding, staffing levels, and local infrastructure. The objectives are not intended to limit or guarantee the amount of work that will be accomplished. More work may be accomplished if additional infrastructure or funding, such as increased budget allocations, partnerships, or other external sources, becomes available. Less work could occur if funding is less than expected, additional infrastructure is not constructed, or existing infrastructure declines and becomes unusable.

Objectives are expected to be accomplished during the first decade of the plan period, unless otherwise indicated within the objective statement. The objectives reflect the activities and program outcomes necessary to achieve or maintain desired conditions. Objectives are displayed for each Blue Mountains national forest in table 2 through table 6. The tables display the portion of the Ochoco administered by the Malheur National Forest as part of the Malheur.

Watershed Restoration

The three national forests have identified watershed restoration objectives relevant to conditions that pose substantial risk and consequence to maintaining or attaining aquatic and riparian desired

conditions. The management actions to meet these objectives should be achievable within the life of the plan (15 years).

Objectives for individual restoration treatments were developed that outline the general scope and magnitude of projected treatments and their general locations. These could include, but are not limited to, the following:

- soil and water resource improvements
- fish passage improvements
- instream habitat improvements
- riparian and floodplain vegetation treatments
- road and trail improvements focused on watershed and aquatic resources
- road storage treatments and road decommissioning

In developing objectives, the highest priorities for restoration include the removal of major factors posing risks to the integrity and resiliency of watersheds and riparian and aquatic ecosystems. The watershed function objectives in table 2 are from the 2011 Watershed Condition Framework Technical Guide (USDA Forest Service 2011b), subsequent versions of this guide, comparable methods, or a combination of these references. Other broad-scale or local inventory, assessment and monitoring data and analysis can be used to refine initial classifications made per the Watershed Condition Framework.

The watershed condition class terminology for functioning properly, functioning-at-risk, and impaired function are equivalent to functioning appropriately, functioning-at-risk and functioning at unacceptable risk categories within the matrix of pathways and indicators (U.S. Fish and Wildlife Service 1998, and respectively equivalent to properly functioning or at risk or not properly functioning categories within the matrix of pathways and indicators used by the National Marine Fisheries Service (1996).

Table 2. Amount of restoration on each national forest to achieve watershed function objectives

Objective Statements	Malheur	Umatilla	Wallowa-Whitman
Improve riparian and wetland function by: Restoring floodplain connections, channel morphology, channel structure, and flow regime (flood flows and low flows) (stream miles) (WR1)	80 miles	90 miles	90 miles
Restoring riparian/wetland species composition (riparian acres) by increasing natural seedling establishment, planting, fencing, or modifying riparian management (riparian acres) (WR2)	300 acres	165 acres	225 acres
Increasing effective stream shade (WQ objective 1) by increasing amount and extent of woody riparian species and increasing age-class structure of terrestrial vegetation in MA 4 (stream miles) (WR3)	450 miles	225 miles	375 miles

Objective Statements	Malheur	Umatilla	Wallowa-Whitman
Improve riparian and wetland function by: Increasing extent and vegetative species diversity of off-channel and isolated wetlands by restoring hydrologic pathways, modifying existing water diversions, or fencing (number of sites) (WR4)	30 sites	40 sites	40 sites
Increasing the number and extent of beaver-created wetlands (sites)	12 sites	10 sites	12 sites
Improve stream channel and aquatic habitat function by: Improving riparian habitat conditions (riparian acres, WR1-3)	600 acres (annually)	525 acres (annually)	675 acres (annually)
Restoring channel morphology to reflect natural conditions (miles)	38 miles	45 miles	60 miles
Increasing habitat complexity through channel reconstruction, placement of large wood or other structures, habitat enhancement (miles)	75 miles	90 miles	113 miles
Increasing aquatic habitat connectivity through culvert replacement (number of culverts)	90 culverts 143 stream miles	75 culverts 68 stream miles	90 culverts 135 stream miles
(W1) Increase the number of watersheds in condition class 1 (from CC2) and 2 (from CC3) through active restoration. Measure: number of subwatersheds (HUC6) with improved condition.	16 watersheds	14 watersheds	24 watersheds
Improve hydrologic function by: Improving forest vegetative conditions (acres) (WH1)	7,800 acres (annually)	6,600 acres (annually)	7,300 acres (annually)
Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	600 acres	750 acres	950 acres
Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (road miles) (WH3)	30-35 miles road surface treated (annually)	30-35 miles road surface treated (annually)	30-35 miles road surface treated (annually)

Table 3. Amount of restoration on each national forest to achieve species diversity objectives

Objective Statements	Malheur	Umatilla	Wallowa-Whitman
In cooperation with state fish and wildlife agencies, expand bull trout occurrence within 10 years into unoccupied suitable stream segments within its historic range.	1 segment	1 segment	1 segment
Restore habitat quality and connectivity within and between stronghold watersheds for aquatic species, with emphasis on strongholds for federally listed aquatic species.	4-6 subwatersheds or 80-120 stream miles	3-5 subwatersheds or 60-100 stream miles	6-9 subwatersheds or 120-180 stream miles

Table 4. Amount of restoration on each national forest to achieve plant species composition objectives

Objective Statements	Malheur	Umatilla	Wallowa-Whitman
Develop habitat management plans for Spalding's Catchfly key conservation areas.	N/A	Lick Creek key conservation area (also called Blue Mtn. Foothills)	Lower Imnaha, Crow Creek, and Clear Lake Ridge key conservation areas

Table 5. Amount of restoration on each national forest to achieve soil quality objectives

Objective Statements	Malheur	Umatilla	Wallowa-Whitman
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road realignment and improving forest vegetation conditions.	200-400 acres	200-400 acres	150-250 acres
Restore soil function (also see objectives for 1.1 Watershed Function).	175-350 acres	175-350 acres	75-150 acres

Table 6. Amount of restoration on each national forest to achieve water quality objectives

Objective Statements	Malheur	Umatilla	Wallowa-Whitman
Improve water quality through implementation of water quality restoration plans.	4-6 watersheds 160-240 stream miles	5-7 watersheds 200-280 stream miles	5-7 watersheds 200-280 stream miles

Standards and Guidelines

Definition:

- 36 CFR 219.7 (2012) (iii) **Standards**. A standard is a mandatory constraint on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.
- 36 CFR 219.7 (2012) (iv) **Guidelines**. A guideline is a constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met (section 219.15(d)(3)). Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

General Riparian Management

Standard RMA-1S. Riparian management areas include portions of watersheds where aquatic and riparian-dependent resources receive primary management emphasis. When riparian management area desired conditions are functioning properly, projects shall protect or maintain those conditions. When riparian management area desired conditions are not yet achieved or riparian management areas have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects or permitted activities shall

restore or not retard attainment of desired conditions.[35] Short-term adverse effects from project activities may occur when they support long-term recovery of riparian management area desired conditions.[36] Exceptions to this standard include situations where Forest Service authorities are limited (Alaska National Interest Lands Conservation Act (ANILCA), 1872 Mining Law, valid State water right, etc.). In those cases, project effects shall be minimized and not retard attainment of desired conditions to the extent possible within Forest Service authorities. Use Blue Mountains Aquatic and Riparian Conservation Strategy attachment B (for example, diagnostic indicators and riparian management area ecological process and function descriptions) to assist in determining compliance with this standard.

Standard RMA-2S. Herbicides, insecticides, pesticides and other toxicants, and other chemicals shall be applied only to maintain, protect, or enhance aquatic and riparian resources or to restore native plant communities in a manner that does not harm aquatic or riparian resources.

Standard RMA-3S. Trees felled for safety shall be retained onsite unless in excess of what is needed to achieve aquatic and riparian desired conditions. If the desired quantity and size distribution of large wood has been met on site, the wood can be transported to other aquatic and riparian restoration projects.

Guideline RMA-4G. Water drafting sites should be located and managed to minimize adverse effects on stream channel stability, sedimentation, and instream flows needed to maintain riparian resources, channel conditions, and fish habitat. To prevent the spread of invasive species, water should not be discharged into other waterbodies.

Standard RMA-5S. Pumps shall be screened at drafting sites to prevent entrainment of fish and shall have one-way valves to prevent back-flow into streams.

Guideline RMA-6G. Fish habitat and water quality should be protected when withdrawing water for administrative purposes.

Standard RMA-7S. Refueling shall occur with appropriate containment equipment and a spill response plan in place. Wherever possible, storage of petroleum products and refueling will occur outside of riparian management areas. The use of containment devices, absorbent pads, and a developed spill plan will help reduce the risk of fuel and petroleum products from getting into streams and other waterways if an accident were to occur. If refueling or storage of petroleum products is necessary within riparian management areas, these operations will be conducted no closer than 100 feet from waterways.

Timber Management in Riparian Management Areas

Standard TM-1S. Silvicultural treatments shall occur in riparian management areas only as necessary to maintain, enhance, or restore desired conditions for aquatic and riparian resources. When conducted, these activities shall avoid or minimize adverse effects to aquatic and riparian

[35] Per Watershed Condition Framework Technical Guide, USDA Forest Service (2011b), subsequent versions of this guide, other comparable methods, or a combination of these references. Other broad-scale or local inventory, assessment and monitoring data and analysis can be used to refine initial classifications made per the Watershed Condition Framework. The watershed condition class terminology for functioning properly, functioning-at-risk, and impaired function are equivalent to functioning appropriately, functioning-at-risk and functioning at unacceptable risk categories within the matrix of pathways and indicators (U.S. Fish and Wildlife Service 1998, and respectively equivalent to properly functioning or at risk or not properly functioning categories within the matrix of pathways and indicators used by the National Marine Fisheries Service (1996).

[36] The definitions and rationale for the terms maintain, restore, degrade, retard attainment, short-term, and long-term are included in forest plan standard WM-1S.

resources. Vegetation in riparian management areas shall not be subject to regularly scheduled timber harvest because they are not part of the timber suitability landbase.

Standard TM-2S. Fuelwood cutting shall not be authorized in riparian management areas unless specifically designed to attain aquatic and riparian desired conditions.

Guideline TM-3G. Use of existing or construction of new landings, designated skid trails, staging, and decking should not occur in riparian management areas, unless they are associated with projects designed to improve riparian management areas conditions. These features should:

- be of minimum size;
- be located outside the active floodplain; and
- avoid negative effects to large wood, bank integrity, temperature, and sediment levels.

Guideline TM-4G. Yarding activities should achieve full suspension over the active channel; unless other alternatives will have less damage to riparian areas and stream channels.[37]

Standard TM-5S. Silvicultural practices shall include provisions, as appropriate, to avoid detrimental changes in water temperatures, blockages of water courses; including protection for streams, stream banks, shorelines, lakes, wetlands, and other bodies of water, and deposits of sediment.

Standard TM-6S. Silvicultural practices shall include provisions (for example, best management practices) for the maintenance or restoration of soil resources.

Standard TM-7S. Timber harvest on lands not suitable for timber production shall occur only to meet desired conditions for each management area other than timber production.

Guideline TM-8G. In watersheds in which stream channels and aquatic habitats are in properly functioning condition, forest vegetation within riparian management areas should be managed to maintain or increase large wood recruitment and delivery to streams.

Standard TM-9S. In watersheds in which stream channels and aquatic habitats are not in properly functioning condition, and where instream wood frequency and volume are below reference conditions, site potential, or both, manage forest vegetation within riparian management areas to maintain or increase large wood recruitment and delivery to streams.

Roads Management in Riparian Management Areas

Guideline RF-1G. New roads and trails should not be constructed within riparian management areas unless no other feasible alternative exists.

Guideline RF-2G. Temporary roads, including stream crossings, in riparian management areas should be minimized. Temporary roads, if constructed, should be managed to protect and restore aquatic and riparian desired conditions.

Standard RF-3S. Side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in riparian management areas shall be avoided.

Standard RF-4S. Fill material shall not be placed on organic debris in riparian management areas.

[37] Active channel is the bank full width of flowing perennial or intermittent streams.

Standard RF-5S. Disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow shall be avoided when constructing or reconstructing roads or landings either inside or outside of riparian management areas.

Guideline RF-6G. Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Minimize impacts where avoidance is not practical.

Standard RF-7S. New or replaced permanent stream crossings shall be designed to allow for the 100-year flood and its bedload and debris. One-hundred-year flood estimates will reflect the best available science regarding potential effects of climate change.

Standard RF-8S. Where physically feasible, construction or reconstruction of stream crossings will avoid diversion of streamflow out of the channel and down the road in the event of crossing failure.

Standard RF-9S. Construction or reconstruction of stream crossings shall provide and maintain passage for all life stages of all native and desired non-native aquatic and riparian-dependent organisms. Crossing designs shall reflect the best available science regarding potential effects of climate change on peak flows and low flows.

Guideline RF-10G. Fish passage barriers should be retained where they serve to restrict access by undesirable nonnative species and are consistent with restoration of habitat for native species.

Guideline RF-11G. Design roads to minimize delivery of water and sediment from roads to streams. Avoid or minimize disruption of hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when constructing, reconstructing, and maintenance of roads or landing.

Guideline RF-12G. Road drainage should be routed away from potentially unstable channels, fills, and hillslopes to the extent practicable.

Standard RF-13S. Road maintenance and new road construction shall be designed to minimize adverse effects to threatened, endangered, proposed, or candidate aquatic species and their habitat.

Grazing Management in Riparian Management Areas

Standard GM-1S. Manage livestock grazing to attain aquatic and riparian desired conditions. Where livestock grazing is found to prevent or retard attaining aquatic and riparian desired conditions, modify grazing practices (such as number of livestock, timing, and physical structures). If adjusting practices is not effective, remove livestock from that area using appropriate administrative authorities and procedures.

Standard GM-2S. New livestock handling facilities, management facilities, or both shall be located outside riparian management areas unless they do not prevent or retard attaining aquatic and riparian desired conditions.

Guideline GM-3G. The purpose of this guideline is to manage livestock grazing to help attain and maintain aquatic and riparian desired conditions over time. Specifically, it is intended to maintain or improve vegetative and stream conditions, help ensure the viability of aquatic species, provide important contributions to the recovery of federally listed species, and facilitate attainment of State water quality standards.

The annual livestock use and disturbance indicators described below should be applied to help achieve, over longer timeframes, conditions at site and watershed scales that enable attainment and maintenance of desired conditions. The values specified below are starting points for management. Only those indicators and numeric values that are appropriate to the site and necessary for maintaining or moving towards desired conditions should be applied.[38] Specific indicators and indicator values should be prescribed and adjusted, if needed, in a manner that reflects existing and desired conditions and the natural potential of the specific geoclimatic, hydrologic, and vegetative setting in which they are being applied.[39] Indicators and indicator values should be adapted over time based on long-term monitoring and evaluation of conditions and trends. Alternative use and disturbance indicators and values, including those in current Endangered Species Act consultation documents or non-Endangered-Species-Act allotment management plans or allotment National Environmental Policy Act decisions, may be used if they are based on best available science and monitoring data and meet the purpose of this guideline.

4. Where desired conditions for water quality, aquatic habitat, and riparian vegetation have been attained[40] and riparian vegetation is in late-seral conditions[41], protect or maintain those conditions by managing annual livestock grazing use and disturbance as follows [42]:

    - maintain a minimum of 4-inch residual stubble height [43] of key herbaceous species on the greenline;
    - utilize no more than 30-45 percent of deep-rooted herbaceous vegetation in the active floodplain[44] and, as needed, in other critical portions of the riparian management area;
    - limit streambank alteration[45] to no more than 20-25 percent; and

[38] Not all indicators may apply to a particular site. For example, stubble height is a meaningful indicator for lower gradient streams where herbaceous vegetation plays an important role in stabilizing streambanks. It is generally less useful for steeper channels, where channel morphology is controlled by coarse substrates. Moreover, not all numeric values may apply to a particular site (for example, sites with short graminoids).

[39] Indicator values for specific sites should be determined based on consideration of local conditions including, but not limited to, the degree of departure between existing and desired conditions, the current and desired rate of improvement, site sensitivity to grazing, grazing season, the presence of special status species (for example, Endangered-Species-Act-listed species, regional forester's sensitive species) that are sensitive to grazing, whether or not water quality standards and related requirements (for example, total maximum daily loads for impaired waters) are being met, and the site's importance in maintaining or attaining those standards and requirements. Consideration of these conditions is especially important in prescribing specific stubble height values within the 4-inch to 6-inch range and streambank alteration values within the 15 to 20 percent range.

[40] Assessment of conditions and trends should be based on best available information at a variety of spatial and temporal scales. Site-specific information is particularly important.

[41] Late seral conditions means the existing riparian vegetation community is similar to the potential natural community composition (per Winward 2000).

[42] Per PACFISH-INFISH Monitoring, Multiple Indicator Monitoring (BLM Technical Reference 1737-23) protocols or comparable methods for stubble height, streambank alteration, and use of woody species. Per Bureau of Land Management protocols (BLM/RS/ST-96/004+1730) or comparable methods for herbaceous utilization.

[43] Stubble height criteria apply at the end of the grazing period, when that period ends after the growing season. When the grazing period ends before the growing season does, stubble height criteria can be applied at the end of the grazing period or the end of the growing season.

[44] Active floodplain is defined as the area bordering a stream inundated by flows at a surface elevation that is two times the maximum bankfull depth (measured at the thalweg).

[45] Streambank alteration criteria apply within 1-2 weeks of removal of livestock from each pasture.

- limit use of woody species to no more than 30-40 percent of current year's leaders along streambanks and, as needed, in other critical portions of the riparian management area.

5. Where desired conditions for water quality, aquatic habitat, and/or riparian vegetation have not yet been attained, but conditions are moving towards those desired conditions,[7] enable continued recovery by managing annual livestock grazing use and disturbance as follows:

   - maintain a minimum of 4-inches to 6-inches residual stubble height of key herbaceous species on the greenline;[6]
   - follow the criteria for utilization of deep-rooted herbaceous vegetation, streambank alteration, and use of woody species described in (1).

6. Where desired conditions for water quality, aquatic habitat, and/or riparian vegetation have not been attained and conditions are not moving towards those desired conditions,[7] enable recovery by managing annual livestock grazing use and disturbance as follows:

   - maintain a minimum of 6-inches residual stubble height of key herbaceous species on the greenline;
   - utilize no more than 30-35 percent of deep-rooted herbaceous vegetation in the active floodplain and, as needed, in other critical portions of the riparian management area;
   - limit streambank alteration to no more than 15-20 percent,[6] and
   - limit use of woody species to no more than 20-30 percent of current year's leaders along streambanks and, as needed, in other critical portions of the riparian management area.

Guideline GM-4G. During allotment management planning, existing livestock handling or management facilities that prevent or retard attaining aquatic and riparian desired conditions should be removed, as appropriate.

Guideline GM-5G. Livestock trailing, watering, loading, and other handling in riparian management areas should be avoided or minimized.

Standard GM-6S. Livestock grazing shall be managed and implemented to avoid trampling federally listed threatened or endangered fish redds.

Recreation Management

Guideline RM-1G. New facilities or infrastructure should not be placed within expected long-term channel migration zones if it has the potential to impact channel or floodplain function. If some facilities must occur in riparian management areas (for example, road stream crossings, boat ramps, docks, and interpretive trails), locate and design them to minimize impacts on floodplains and other riparian dependent resource conditions (for example, within geologically stable areas, avoiding major spawning sites).

Guideline RM-2G. Existing recreation facility components that are causing unacceptable impacts in riparian management areas should be removed or relocated. Site condition should be restored to improve riparian area function.

Minerals Management

Guideline MM-1G. For operations in riparian management areas, ensure operators take all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian-dependent resources that may be affected by the operations. Ensure operations do not retard or prevent attaining aquatic and riparian desired conditions. Exceptions to this guideline include situations where Forest Service has limited discretional authorities. In those cases, project effects should be minimized and should not prevent or retard attaining aquatic and riparian desired conditions to the extent possible within those authorities.

Guideline MM-2G. To the maximum extent possible, construct and locate new structures, support facilities, and roads outside of riparian management areas. If new structures, support facilities and roads cannot be constructed outside riparian management areas because of site limitations, then construct and manage them to minimize adverse effects to aquatic and riparian dependent resources. Existing roads and facilities should be maintained to minimize damage to aquatic and riparian dependent resources, and should be removed or relocated if roads and facilities are causing unacceptable impacts in riparian management areas. When structures, support facilities, and roads are no longer required for mineral activities, they should be restored or reclaimed to achieve aquatic and riparian desired conditions.

Standard MM-3S. Mine waste with the potential to generate hazardous material (as defined by the Comprehensive Environmental Response, Compensation, and Liability Act: CERCLA) shall not be authorized within riparian management areas where groundwater contamination is possible, or both. The exception is temporary staging of waste during abandoned mine cleanup.

Guideline MM-4G. Mineral operations should minimize adverse effects to aquatic and riparian-dependent resources in riparian management areas. Require best management practices and other appropriate conservation measures to mitigate potential mine operation effects.

Standard MM-5S. Mineral activities on National Forest System lands shall avoid or minimize adverse effects to aquatic threatened or endangered species and populations or their designated critical habitat.

- All suction dredge mining activities in habitat for aquatic threatened or endangered species and populations or in their designated critical habitat shall be evaluated by the district ranger to determine if the mining activity is causing or "will likely cause significant disturbance of surface resources."[46] A likelihood that a threatened or endangered species "take" (defined in Section 3[18] of the Endangered Species Act of 1973 as amended) incidental to the mining activity is an example of a significant resource disturbance. Other significant disturbances that do not involve incidental take might involve effects on channel stability or stream hydraulics.
- If the district ranger determines that placer mining operations are causing or will likely cause significant disturbance to surface resources, the district ranger shall contact and inform the operator to seek voluntary compliance with 36 CFR 228 mining regulations and to cease operations until compliance.

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[46] The phrase ''will likely cause significant disturbance of surface resources'' means that, based on past experience, direct evidence, or sound scientific projection, the district ranger reasonably expects that the proposed operations would result in impacts to National Forest System lands and resources which more probably than not need to be avoided or ameliorated by means such as reclamation, bonding, timing restrictions, and other mitigation measures to minimize adverse environmental impacts on National Forest System resources.

Wildland Fire Management Activities and Fuels Management within Riparian Management Areas

Guideline FM-1G. Locate temporary firefighting facilities (for example, incident bases, camps, helibases, staging areas, helispots, and other centers) for incident activities outside riparian management areas. When no practical alternative exists, all appropriate measures to protect, maintain, restore, or enhance aquatic and riparian dependent resources should be used. If the only suitable location for such activities is within a riparian management area, use may be granted following review by a resource advisor and discussion with the agency administrator. The resource advisor will work the incident management team to prescribe the location, use conditions, and rehabilitation requirements. Use an interdisciplinary team to predetermine suitable incident base and helibase locations.

Guideline FM-2G. Aerial application of chemical retardant, foam, or other fire chemicals is prohibited within 300 feet (slope distance) of perennial and intermittent waterways. Waterways are defined as any body of water (including lakes, rivers, streams, and ponds) whether or not it contains aquatic life except in cases where human life or public safety is threatened and chemical use could be reasonably expected to alleviate that threat. This includes open water that may not be mapped as such on avoidance area maps and intermittent streams that are running or holding surface water at the time of retardant use.

Standard FM-3S. Portable pump set-ups shall include containment provisions for fuel spills and fuel containers shall have appropriate containment provisions. Vehicles shall be parked in locations that avoid entry of spilled fuel into streams. When drafting, pumps shall be screened at drafting sites to prevent entrainment of aquatic species, screen area shall be sized to prevent impingement on the screens, and shall have one-way valves to prevent backflow into streams. Use National Marine Fisheries Service-approved screening criteria where listed fish or critical habitat are present.

Guideline FM-4G. Locate and configure firelines to minimize sedimentation to waterbodies, capture of overland and stream flows, and development of unauthorized roads and trails. Restore firelines following suppression or prescribed fire activities.

Standard FM-5S. To minimize soil damage when chipping fuels within riparian management areas, chip bed depths on dry soils shall be limited to 7.5 centimeters or less (Busse et al. 2006).

Guideline FM-6G. Disturbed areas, such as firelines, drop-points, camps, roads, and trails, should be restored by actions such as scattering slash piles, replacing logs and boulders, scarifying soils, recontouring terrain, and reseeding with native species.

Guideline FM-7G. Pumping directly from a stream channel should be avoided if chemical products are to be injected directly into the system. When chemicals are used, pumping should be conducted from a fold-a-tank that is located outside the riparian area.

Guideline FM-8G. Minimum impact suppression tactics should be utilized in sensitive areas, such as designated wilderness areas, designated wild and scenic river corridors, research natural areas, botanical areas, riparian management areas, cultural and historic sites, developed recreation areas, special use permit areas that have structures, and historic and recreational trails. Minimum impact suppression tactics should also be used for post-fire restoration activities.

Guideline FM-9G. Prescribed burn direct ignition in riparian management areas should not be used unless site and project scale effects analysis demonstrates that it would not retard attaining aquatic and riparian desired conditions.

Standard FM-10S. Ensure prescribed burn projects contribute to and do not retard the attainment of the aquatic and riparian desired conditions.

Guideline FM-11G. Chemicals or retardant should not be used for suppression or mop-up within riparian areas.

Standard FM-12S. Pumps and charged hoses shall not be back flushed into stream channels, wetlands, or surface water.

Lands and Special Uses, including Hydropower in Riparian Management Areas

Standard LH-1S. Authorizations for all new and existing special uses, including, but not limited to water diversion or transmission facilities (for example, pipelines and ditches), energy transmission lines, roads, hydroelectric, and other surface water development proposals, shall result in the reestablishment, restoration, or mitigation of habitat conditions and ecological processes identified as being essential for the maintenance or improvement of habitat conditions for fish, water and other riparian dependent species and resources. These processes include in-stream flow regimes, physical and biological connectivity, water quality, and integrity and complexity of riparian and aquatic habitat.

Standard LH-2S. New support facilities shall be located outside of riparian management areas. Support facilities include any facilities or improvements (for example, workshops, housing, switchyards, staging areas, and transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation or enhancement measures.

Guideline LH-3G. If existing support facilities are located within the riparian management areas, they should be operated and maintained to restore or enhance aquatic and riparian dependent resources. At time of permit re-issuance, consider removing support facilities, where practical.

Guideline LH-4G. Land exchanges should avoid the disposition of occupied habitat of threatened, endangered, candidate, proposed, or sensitive species.

Watershed (Forestwide)

Standard WM-1S. When watershed function[47] desired conditions are being achieved and watersheds are functioning properly[48], projects shall maintain those conditions. When watershed function desired conditions are not yet achieved or watersheds have impaired function or are functioning-at-risk and to the degree that project activities would contribute to those conditions, projects shall restore or not retard attainment of desired conditions. Short-term adverse effects from project activities may occur when they support or do not diminish long-term recovery of watershed function desired conditions and federally listed species. Exceptions to this standard include situations where Forest Service authorities are limited (Alaska National Interest Lands Conservation Act (ANILCA), 1872 Mining Law, valid State water right, etc.). In those cases,

[47] Per revised land management plan watershed function desired conditions (watershed function, hydrologic, riparian, wetland, stream channel, groundwater dependent ecosystem, and aquatic habitat).

[15] Per Watershed Condition Framework Technical Guide (USDA Forest Service, 2011b), subsequent versions of the guide, comparable methods, or a combination of these references. Other broad-scale or local inventory, assessment and monitoring data and analysis can be used to refine initial classifications made per Watershed Condition Framework. The Watershed Condition Framework categories of terminology for “functioning properly”, “functioning-at-risk”, and impaired function are equivalent to the “functioning appropriately” “functioning-at-risk” and “functioning at unacceptable risk” categories within the matrix of pathways and indicators (USFWS 1998), and to the respectively equivalent to “properly functioning” or “at risk” or “not properly functioning” categories within the matrix of pathways and indicators used by National Marine Fisheries Service (1996).

project effects shall be minimized and not retard attainment of desired conditions for watershed function, to the extent possible within Forest Service authorities. Use Blue Mountains Aquatic and Riparian Conservation Strategy attachment B to assist in determining compliance with this standard. See the glossary for definitions of maintain, degrade, restore, retard attainment, short-term adverse effects, and long-term recovery.

Standard WM-2S. All projects shall be implemented in accordance with best management practices, as described in national and regional technical guides.

Key Watershed and Subwatersheds with Endangered Species Act Critical Habitat for Aquatic Species (Forestwide)

Standard KW-1S. In key watersheds or subwatersheds with Endangered Species Act critical habitat for aquatic species or subwatersheds containing listed aquatic species that are functioning properly,[49] there shall be no net increase (1 mile of road-related risk reduction for every new mile of road construction), where they are functioning at risk,[50] there shall be a net decrease (1.5 miles of road-related risk reduction for every new mile of road construction), and where they are impaired function, there shall be a net decrease (2.0 miles of road-related risk reduction for every new mile of road construction) in system roads that affect hydrologic function. Priority for road-related risk reduction shall be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems. Road-related risk reduction will occur prior to new road construction unless logistical restrictions require post-construction risk reduction. This standard shall apply to the affected subwatershed when new system road construction is proposed in that subwatershed, and shall not be offset by reductions in open-road densities in other subwatersheds.

Standard KW-2S. In key watersheds and subwatersheds with Endangered Species Act critical habitat for aquatic species or subwatersheds containing listed aquatic species, hydroelectric and other surface water development authorizations shall include requirements for instream flows and habitat conditions that maintain or restore native fish and other desired aquatic species populations, riparian dependent resources, favorable channel conditions, and aquatic connectivity.

Standard KW-3S. In key watersheds and in subwatersheds with Endangered Species Act critical habitat for aquatic species or subwatersheds containing listed aquatic species, new hydroelectric facilities and water developments shall not be located in a key watershed unless it can be demonstrated that there are minimal risks, no adverse effects, or both to the fish and water resources for which the key watershed was established.

Watershed Restoration (Forestwide)

Guideline RE-1G. Watershed restoration projects should be designed to utilize or emulate natural ecological processes to the extent practicable, for meeting and maintaining restoration objectives.

Guideline RE-2G. Watershed restoration projects should be designed to minimize the need for long-term maintenance.

[49] "Functioning properly", "functioning-at-risk", and "impaired function" for the roads and trails indicator of Watershed Condition Framework are defined in Watershed Condition Framework Technical Guide, USDA Forest Service, 2011b. Local inventory, assessment and monitoring data and information can be used to refine initial classifications made per Watershed Condition Framework.

[50] "Functioning properly", "functioning-at-risk", and "impaired function" for the roads and trails indicator of Watershed Condition Framework are defined in Watershed Condition Framework Technical Guide, USDA Forest Service, 2011b

Standard RE-3S. Except where Forest Service authorities are limited, mitigation or planned restoration shall not be used as a substitute for preventing long-term watershed or habitat degradation.

Standard RE-4S. Minimize water and sediment delivery from roads and trails to streams. This includes roads, or road segments, whether inside and outside of riparian management areas, that deliver sediment to streams.

Standard RE-5S. Minimize adverse effects to federally listed, proposed, and candidate species and their designated and proposed critical habitat in accordance with Forest Service authorities. Management activities shall not retard recovery[51] of listed, and proposed, and candidate species and their designated and proposed critical habitat in the long-term in accordance with Forest Service authorities. Federally listed, proposed, and candidate species and their designated and proposed critical habitats shall be managed in accordance with their recovery or other conservation plans, in accordance with Forest Service authorities.

Invasive Species (Forestwide)

Guideline IS-1G. Avoid cross contamination between streams, reservoirs and lakes from pumps, suction and dipping devices or any other equipment. Avoid dumping water directly from one stream or lake into another. Disinfect water storage and conveyance equipment including sampling equipment, water tenders, pumps, engines, and aircraft prior to use on the national forest.

Suitability of Areas

Definition:

> 36 CFR 219.3 (1982) **Suitability**: The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

Specific lands within a plan area will be identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. Suitability describes the appropriateness of applying certain resource management practices (uses) to a particular area of land. A unit of land may be suitable for a variety of individual or combined uses.

The plan will also identify lands within the plan area as not suitable for uses that are not compatible with desired conditions for those lands. The suitability of lands need not be identified for every use or activity. Suitability identifications may be made after consideration of historic uses and of issues that have arisen in the planning process. Every plan must identify those lands that are not suitable for timber production (36 CFR 219.11).

For example, a project with the purpose of timber production (see glossary) may only occur in an area identified as suitable for timber production [16 U.S.C. 1604(k)] (see Suitability discussion). The documentation for the project should confirm the project area meets the suitability requirements.

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[51] Retard recovery - management action effects that, individually or in combination with other management actions or natural disturbances, measurably slow the natural rate of recovery.

Except for projects with a purpose of timber production, a project or activity can be consistent with plan suitability determinations in either of two ways:

- The project or activity is a use identified in the plan as suitable for the location where the project or activity is to occur; or
- The project or activity is not a use identified in the plan as suitable for the location (the plan is silent on the use or the plan identifies the use as not suitable), but the responsible official determines that the use is appropriate for that location's desired conditions and objectives.

An area may be identified as generally suitable for uses that are compatible with desired conditions and objectives for that area. An area may be identified as generally not suitable for uses that are not compatible with desired conditions and objectives for that area. Identification of an area as generally suitable or generally not suitable for a use is guidance for project and activity decisionmaking and not a commitment nor a final decision approving projects and activities.

Uses or activities in specific areas are approved through project and activity decisionmaking.

Suitable uses are identified for each management areas in the forest plans to help further refine suitable uses and guide management. Suitable activities or uses in riparian management areas maybe adjusted based on watershed analysis.

Suitability for Riparian Management Areas

Riparian management areas are **generally unsuitable** for:

- new road or trail construction
- salable mineral activities, such as gravel and sand
- energy development (for example, wind farms, utility corridors, pipelines, etc.)

Riparian management areas are **unsuitable** for:

- regularly scheduled timber production (regularly scheduled timber harvest on suitable lands); since they are not part of our timber suitability landbase
- grazing management that degrades aquatic habitat conditions or impedes attainment of aquatic and riparian-dependent resources

Riparian management areas are **generally suitable** for:

- silvicultural treatments necessary to maintain, enhance or restore conditions for aquatic and riparian resources. When conducted, these activities shall avoid or minimize adverse effects to aquatic and riparian resources and not degrade or retard attainment of aquatic and riparian-dependent resources
- timber harvest and mechanical fuel treatment may be allowed under certain circumstance to meet riparian management area desired conditions
- grazing management that does not degrade or retard attainment of aquatic and riparian-dependent resources
- motor vehicle use consistent with 36 CFR 212 of the Travel Management Rule

Monitoring

Section 219.12 Monitoring. (a) Plan monitoring program.

- The responsible official shall develop a monitoring program for the plan area and include it in the plan. Monitoring information should enable the responsible official to determine if a change in plan components or other plan content that guide management of resources on the plan area may be needed. […]
- The plan monitoring program sets out the plan monitoring questions and associated indicators. Monitoring questions and associated indicators must be designed to inform the management of resources on the plan area, including by testing relevant assumptions, tracking relevant changes, and measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions or objectives. Questions and indicators should be based on one or more desired conditions, objectives, or other plan components in the plan, but not every plan component needs to have a corresponding monitoring question.
- The plan monitoring program should be coordinated and integrated with relevant broader-scale monitoring strategies (paragraph (b) of this section) to ensure that monitoring is complementary and efficient, and that information is gathered at scales appropriate to the monitoring questions. For more information, see the 2012 Planning Rule.

Monitoring and evaluation consists of key element monitoring that will occur as implementation of the forest plan progresses (future site-specific actions). Monitoring is part of an adaptive management process that measures the performance of plan implementation against the goals, desired conditions and objectives to which it aspires. It also evaluates whether implementation of standards and guidelines are producing the desired results.

Variation in achieving objectives may occur during the life of the plans because of changes in environmental conditions, available budgets, and other factors. Influences on objectives include recent trends, past experiences, anticipated staffing levels, and budget projections.

Objectives are projections of Forest Service activities and program outcomes that are measurable and time specific. Like goals and desired conditions, objectives are not commitments or final decisions approving projects or activities. They are an effort by the Forest Service to share with the public how progress toward achieving or maintaining the desired conditions during the life of the plans will be measured. The objectives stated are only a partial list of the management activities expected to be accomplished to contribute to maintaining or achieving desired conditions.

Objectives are based on ecological needs, community capacity, and expected funding, including budgets, partnerships, and cooperative agreements. The actual accomplishments will be dependent on actual funding, staffing levels, and local infrastructure. The objectives are not intended to limit or guarantee the amount of work that will be accomplished. More work may be accomplished if additional infrastructure or funding, such as increased budget allocations, partnerships, or other external sources, becomes available. Less work could occur if funding is less than expected, additional infrastructure is not constructed, or existing infrastructure declines and becomes unusable.

Objectives are expected to be accomplished during the first decade of the plan period, unless otherwise indicated within the objective statement. The objectives reflect the activities and program outcomes necessary to achieve or maintain desired conditions.

7. Watershed Analysis

Watershed analysis is an essential component of the Blue Mountains Aquatic and Riparian Conservation Strategy. The content of this section is included in Blue Mountains forest plans as other plan content.

Background

Assessments, which covered the three national forests in the Blue Mountains, were conducted before the forest plans were revised to identify the need to change plan direction and to inform the development of plan components. This section pertains to watershed analysis, which is conducted at finer spatial scales (generally subbasins to subwatersheds, 8-12 digit hydrologic units) as historically used to inform plan implementation, after they have been developed, amended, or revised.

Through implementation of the existing aquatic strategies in the 1990s and early 2000s, watershed analyses have been completed for the majority of National Forest System lands within the Aquatic and Riparian Conservation Strategy area. Consequently, future work will largely focus on efficiently updating, as needed, a portion of those existing analyses to better reflect current watershed conditions and trends, new issues (for example, climate change, invasive species), latest science and policy, and current opportunities.

Purpose

Watershed analysis is an interdisciplinary analysis of the status and trends of watershed and aquatic ecosystem conditions, including key State-designated beneficial uses of water (for example, municipal water supply), and the hydrologic, geomorphic, and biological processes that strongly influence them. This information serves as a foundation for plan implementation through the development of strategic and integrated programs and projects that protect and restore aquatic resources, while enabling informed and sustainable resource use and management. These analyses combined with monitoring and evaluation (see section 9), provide the context and foundation to adaptively execute the other components of the Blue Mountains Aquatic and Riparian Conservation Strategy, including management of riparian management areas and key watersheds, implementation of watershed restoration, and compliance with plan components.

Watershed analysis is intended to guide plan implementation by providing decision-makers and others: (1) information to identify activities that would maintain watershed and aquatic and riparian ecological conditions or move them towards desired conditions; and (2) the context for developing projects and evaluating their consistency, via the National Environmental Policy Act process, with plan direction (desired conditions, objectives, standards, and guidelines associated with watershed and aquatic resources). This includes ensuring that management activities in key watersheds and riparian management areas maintain, restore, or enhance aquatic and riparian resources.

Through identification of actions needed to avoid or minimize adverse effects and/or restore ecosystem conditions and processes, watershed analysis is also intended to enable protection and recovery of listed species and their habitats and to facilitate efficient project-level conferencing and consulting under section 7 of the Endangered Species Act. Similarly, it should enable protection and restoration of water quality and the full range of beneficial uses of water identified by the States and Tribes under the Clean Water Act.

Watersheds to be Analyzed

The Blue Mountains national forests estimated the number of new or updated watershed analyses expected to be completed during the life of the forest plans and identified a set of potential watersheds for which this work will be a priority. Criteria for selecting potential watersheds for analysis included: (1) key watersheds; (2) watersheds that have been identified as priority watersheds during the life of the plan; (3) watersheds that support listed species or contains designated critical habitat; and (4) watersheds wherein management activities are likely to occur that may substantially affect aquatic resources (for example, due to their inherent nature, location, timing or scale).

Watershed analyses should generally be conducted or updated prior to developing and implementing watershed restoration action plans for priority watersheds.

In addition, watershed analyses shall be conducted or updated prior to:

- proposing changes to riparian management area widths;
- timber salvage or construction of facilities in riparian management areas; and
- construction of permanent system roads in riparian management areas.

Line Officer Role

The desired outcome is an efficient, effective analysis that provides a better understanding of watershed structure and function and a set of recommendations that help inform future management actions within and around the watershed. To achieve this goal, line officers should guide analysis teams throughout the analysis process, ensuring that the analysis focuses on the most critical issues and questions and that the scope, type and level of analysis is aligned with management needs and available financial resources and staff. This is critical to avoiding common pitfalls observed in previous analyses, which included unconstrained scope and level of detail.

Analysis Process

The watershed analysis process, as described in the Federal guide to watershed analysis (Regional Ecosystem Office 1995), includes 6 steps to be conducted in an interdisciplinary process:

1. characterizing the study watershed;
2. identifying important water and aquatic resources and key management issues and questions associated with them;
3. describing current resource conditions and trends and the dominant biophysical processes (natural and human caused) responsible for them;
4. comparing and contrasting those conditions with applicable reference conditions;
5. synthesizing and interpreting that information; and
6. identifying opportunities and making management recommendations to maintain or restore watershed and aquatic resources when those conditions are consistent with or trending towards desired conditions or otherwise to improve those resource conditions.

This process involves characterizing the study watershed, describing past and current conditions, assessing trends, synthesizing information, and making management recommendations. The result is a better understanding of watershed structure and function and a set of recommendations that help inform future management actions within and around the watershed.

The watershed (10-digit hydrologic unit) is the primary scale of the analysis. However, since relevant issues, ecological conditions, and dominant biophysical processes often occur at both broader and finer scales, components of the analysis may need to be conducted at a subbasin scale, while others may need to be addressed at a subwatershed or finer scale. Still others (for example, habitat connectivity between and within watersheds) may need to be evaluated at multiple scales. The challenge is to efficiently analyze the interaction of multiple processes operating at multiple spatial and temporal scales and incorporate relevant findings into a concrete watershed conservation and management strategy.

The topics to be covered in a watershed analysis generally include (1) hydrologic and geomorphic processes; (2) vegetation; (3) disturbance regimes; (4) transportation systems; (5) water quality; (6) aquatic and riparian species and habitats; and (7) human uses.

Updating Existing Watershed Analyses

As previously described, most future work will involve updating existing analyses rather than conducting entirely new ones. The process for updates is similar to the analysis process described above, except that updates should be narrowly focused on refreshing, refining, or augmenting only those critical components of the existing documents that do not reasonably address current issues and questions, adequately characterize current resource conditions and trends, align with current science and policy, or reflect contemporary management opportunities.

Line officers should define the scope of these updates and the financial and staff resources available to support them, after considering the recommendations of an interdisciplinary team that has critically reviewed the existing analyses.

General Products

The products of a watershed analysis generally include all or a subset of the following, depending on the scope of the analysis:

- a summary of the current status and trajectory of watershed conditions, aquatic and riparian-dependent resources and their habitat, water quality, and key State-designated beneficial uses of water
- a description of the key historic and ongoing processes (natural and human caused) responsible for those conditions and trends
- an assessment of the status and trends of the watershed with respect to general forestwide desired conditions at applicable scales (subbasin , watershed, or both) and any specific desired conditions for key watersheds, riparian management areas, or both
- any recommended adjustments to the default, forestwide widths for riparian management areas as necessary
- a recommendation for retaining or changing the status of the watershed with respect to the key watershed network (for example, adding or removing the watershed from the network)
- identification, validation, or refinement of restoration actions including instream, aquatic and terrestrial vegetation treatments, and road related treatments.
- any issues that should be considered when designing projects to comply with standards, guidelines, or both for the analysis watershed(s)

- any recommended project design criteria that might be applicable in the analysis watershed(s)
- specific opportunities for managing, protecting, and restoring the watershed and its key resource values. This includes identification of areas within the watershed that are particularly important and activities that could be taken or avoided to protect and restore watershed conditions while achieving other socioeconomic objectives
- a strategic framework for implementing restoration opportunities. This includes a ranked list of Candidate priority subwatersheds (12-digit hydrologic unit) to consider restoring via the National Watershed Condition Framework process, the general type and scope of critical restoration treatments, their general location and priority, and any major considerations for timing/completion of restoration work
- a completed watershed restoration action plan for Watershed Condition Framework priority subwatersheds per the national template (optional)
- significant information gaps and the inventories, monitoring, and/or analyses needed to address those gaps, and their relative priority
- a list of key monitoring questions and indicators.

These products should be informed by and aligned with the major goals, objectives, strategies, and tactics included in other relevant restoration and recovery plans (for example, Endangered Species Act recovery plans, State restoration plans for impaired waters).

Specific map and tabular products may include all or a subset of the following, depending on the scope of the analysis:

- perennial and intermittent streams, fish habitats (including key spawning and rearing areas, critical habitat, etc.), and any major barriers to fish passage
- other special aquatic habitats (side channels, ponds, associated wetlands, etc.) of particular importance
- groundwater-dependent ecosystems (including springs) and important groundwater recharge zones
- key beneficial uses of water
- major water rights and uses
- the quality, quantity, and timing of stream flows and areas and processes that strongly influence them
- any water-quality limited stream segments
- available stream and water quality inventory and monitoring results, including those from the PACFISH-INFISH biological opinion, applicable stream temperature monitoring and assessment programs, the regional stream survey program, and other relevant programs
- key watersheds, priority watersheds, or both in the analysis area
- riparian management areas, including unstable areas
- key geomorphic features and processes strongly influencing watershed conditions and resources
- current and historic forest and rangeland vegetative conditions
- wildfire risks relevant to aquatic and riparian resources

- potential impacts and risks that the road network poses to watershed conditions and aquatic resources
- known and high-risk sites for aquatic and riparian invasive species
- projected climatic changes (for example, stream flows, stream temperatures, aquatic biota, vegetative conditions) relevant to aquatic resources
- a listing of priority restoration treatments, including the location or general area and relative priority and any major considerations for timing and completion of restoration work.

Relationship with Project and Watershed Planning and Landscape Analysis

Watershed analysis is best conducted separate from project-level planning and the National Environmental Policy Act process. Its results are used to identify projects ripe for implementation and its analysis can be used to prepare National Environmental Policy Act analyses, particularly purpose and need statements and existing conditions. A watershed analysis more thoroughly informs decisions. It may also be appropriate for new analyses or significant updates, when a unit is contemplating complex projects covering a wide range of activities over large areas and multiple years, a new watershed analysis or a significant update to an existing analysis should be considered.

Sometimes contemplated large-scale vegetation management projects spanning multiple watersheds require an analysis that helps to understand resources and their interaction with a broader perspective. The watershed analysis approach described here can be applied at broader scales if needed.

Where feasible, watershed analysis should inform the watershed restoration process, as specified in section 8. Specifically, these analyses can guide selection of priority watersheds and development of watershed restoration action plans via the Watershed Condition Framework process (figure 8).

Documentation

Watershed analyses should be a concise synthesis of key information about resource conditions and trends and the recommended management strategies and actions to address them. Line officers should define their scope and review and approve final products. These analyses should be kept in the record and be readily available for use. Supporting geospatial data should also be retained as part of the record. Watershed analyses are not federal actions leading to a decision and do not require National Environmental Policy Act analysis and documentation.

Analysis Resources

Many resources, as described below, are available to support watershed analysis.

Existing Analyses

Much of the watershed analysis process involves the integration and synthesis of existing information. Therefore, identification and review of existing analyses is a critical step in the process. Similar to the assessment phase of plan development or revision (section 6), information from the following documents should be reviewed and synthesized during the analysis process and be used to guide other components of the analysis, as appropriate given the scope of the analysis:

1. results of step A (assessment) of the National Watershed Condition Framework,
2. existing watershed analyses,
3. status reviews and assessments and recovery plans for threatened, endangered, or sensitive species,
4. State assessments and management plans associated with water quantity and quality,
5. results of broad-scale status and trend monitoring programs (for example, PACFISH-INFISH biological opinion),
6. transportation analyses, and
7. climate change vulnerability assessments and adaptation strategies. In addition, relevant broad-scale environmental analyses for the area may be useful.

Watershed analyses are intended to address issues at finer scales, primarily at the watershed scale. However, some of the existing information may only provide context for how conditions in a subbasin or watershed compare with other subbasins or watersheds. Other existing data and reports, however, may provide information about specific conditions within the analysis watershed. Some other sources may do both.

PACFISH (1995) and INFISH (1995) require watershed analysis prior to management actions, including timber harvest and road construction, in priority watersheds or riparian habitat conservation areas. Watershed analysis is required prior to salvage logging within riparian habitat conservation areas or adjusting the widths of riparian habitat conservation areas boundaries. The watershed analyses that have been completed since implementation of PACFISH and INFISH are displayed in attachment A.

Attachment A, table 12 lists the 47 watershed analyses that have been completed by the Malheur, Umatilla, and Wallowa-Whitman National Forests between 1994 and 2006 covering 56 individual watersheds (hydrologic unit code 10). Figure 10 displays watersheds with completed analyses and the year each analysis was completed. Not shown in attachment A, table 12 or figure 10 are watersheds with completed Watershed Action Plans (for example, Camp Creek – Middle Fork John Day River, 2008).

Completed watershed analyses encompass 3.6 million acres of 5.5 million acres of National Forest System lands in the Blue Mountains. Of approximately 1.8 million acres, or 33 percent of the area of National Forest System lands with no completed watershed analysis, 859,500 acres (47 percent) are within wilderness or inventoried roadless areas. After accounting for wilderness and roadless areas, 83 percent of National Forest System acres have completed watershed analyses.

Parts of 64 watersheds in the Blue Mountains are without a completed watershed analysis. Of these, 23 have less than 10,000 acres of National Forest System lands. Of the 41 watersheds with more than 10,000 National Forest System acres, 16 have 50 percent or more of National Forest System area in wilderness or roadless areas. Including the Hells Canyon National Recreation Area, only 17 percent of National Forest System lands in the Blue Mountains within existing roadless or wilderness areas have been the subject of a watershed analysis.

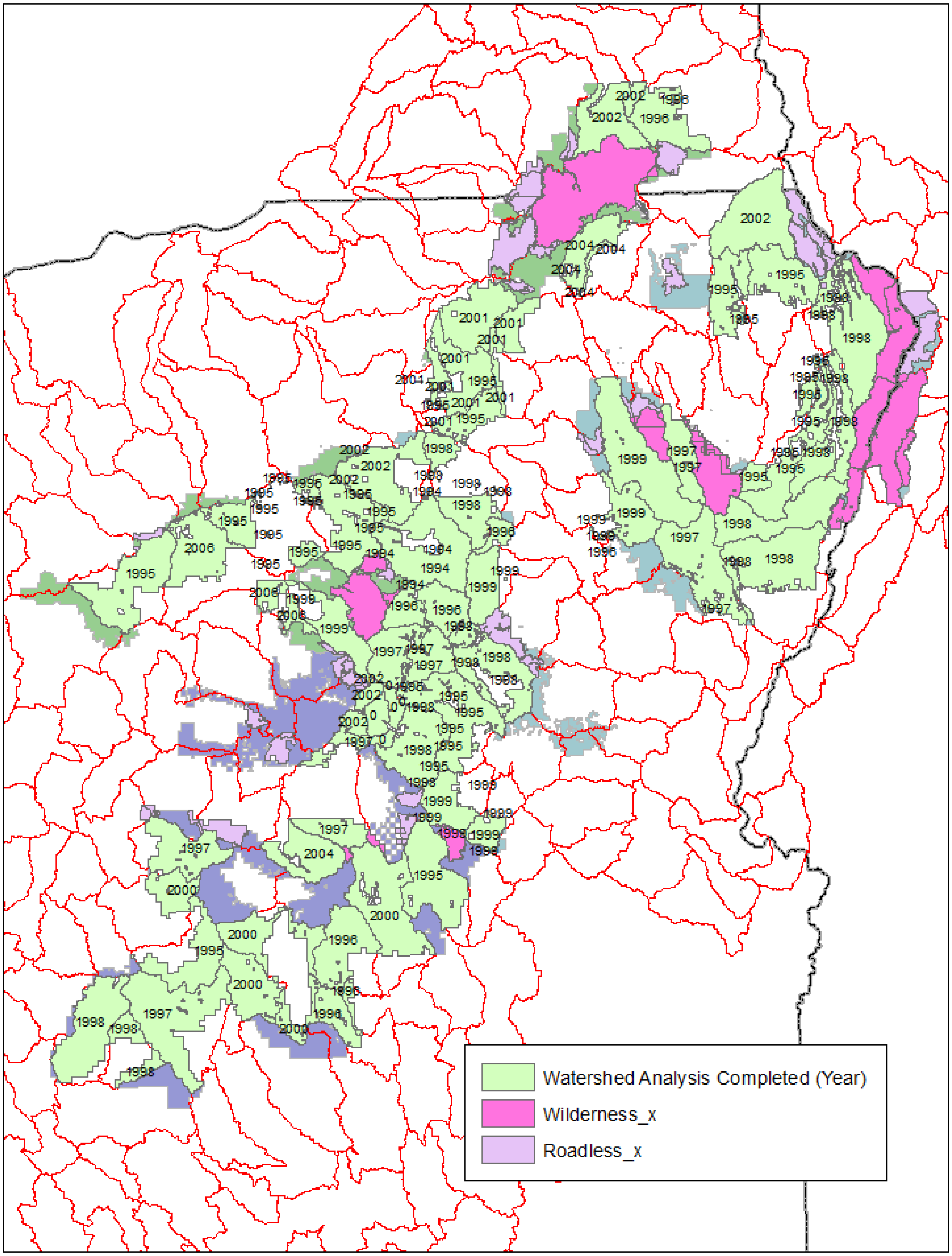

Figure 10. Map showing completed watershed analyses (green) on National Forest System lands in the Blue Mountains. Numbers are year analysis was completed. Wilderness and inventoried roadless areas outside of watersheds with completed watershed analysis are displayed in magenta.

In addition to the listed watershed analyses, at least four broad-scale analyses of watershed and aquatic and riparian habitat conditions have been conducted for areas encompassing watersheds on National Forest System lands in the Blue Mountains. The Pacific Northwest Region (Region 6) assessed basin-scale watershed and habitat conditions in identifying region-wide restoration priorities (Heller et al. 2002, USDA Forest Service 2005). Separate analyses were conducted by individual national forests, to assess watershed, riparian, and aquatic habitat conditions and establish priorities for restoration (Malheur National Forest 2005, Umatilla National Forest 2002, Wallowa-Whitman National Forest 2002). Watershed, riparian, and habitat conditions were re-assessed, along with population status and distribution of four selected surrogate species (bull trout, steelhead, chinook salmon and, redband trout) in order to determine watersheds with the greatest restoration potential and best remaining aquatic habitat conditions for use in naming key watersheds and prioritizing watersheds for restoration. Most recently, watershed conditions were assessed on each national forest using the nationally mandated watershed condition framework, or Watershed Condition Framework (USDA Forest Service 2011).

Analysis Guides

Existing guidebooks, such as “Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis” (Regional Ecosystem Office 1995), provide a logical, structured and organized approach to conducting watershed analyses. Analysis teams are thus encouraged to use relevant components of this guidebook to direct their work. Components of these guidebooks that are beyond the scope or level of detail decided by the line officer should be disregarded.

Datasets and Analysis Tools

Numerous datasets, models, and other analysis tools are available to assist in conducting watershed analysis. Each has different capabilities and strengths and limitations, which need to be critically evaluated prior to their application. Use of these tools should be focused on filling important information gaps needed to address the key management questions identified early in the analysis process.

Available models can simulate a variety of watershed processes, including surface erosion and mass wasting; stream shade, heat loading, or both to streams; large woody debris recruitment; and fluvial and floodplain processes. In addition, existing models can be used to characterize a variety of road-related impacts to watersheds and aquatic ecosystems.

The following datasets are generally available across the region and should be considered for use in the analysis, as needed.

- National Hydrography Dataset and Watershed Boundary Dataset
- Regional fish distribution and fish passage databases
- USGS streamflow monitoring
- streamflow modeling (for example, variable infiltration capacity model)
- Region 6 physical and biological stream survey data and reports
- historic surveys and photos
- National Watershed Condition Assessment
- PACFISH-INFISH biological opinion data and analyses
- stream temperature monitoring and modeling (for example, NorWeST products)
- State and Federal habitat and population monitoring programs
- Recovery plans and status reviews and assessments

- State and Federal water quality monitoring
- State lists of water-quality limited streams (303-d list)
- water rights and uses database
- surface water diversion database
- terrestrial ecological unit inventory
- topographic data (for example, digital elevation models)
- aerial photographs
- existing and potential vegetation
- fire regime condition class maps
- national forest transportation systems
- rangeland condition assessments and monitoring
- regional aquatic and riparian invasive species database
- climate change datasets (snow, flow regimes, stream temperatures, soil-drought)

Typically, these data sources can and should be complemented with local information for the analysis area (for example, localized road condition inventory).

The products of broad-scale status and trend monitoring (section 12), in particular the PACFISH-INFISH biological opinion datasets, can be used to inform analysis of specific watersheds. For example, as a starting point for watershed analysis, analysis teams can consider how upslope and in-channel conditions and trends for a particular watershed fit within the distribution of conditions and trends across all reference (least disturbed) and managed watersheds on Federal lands throughout the Pacific Northwest and Interior Columbia River Basin. Data from reference sites can be used to characterize the range of potential "reference conditions" and assess how existing conditions in a particular watershed compare with them (figure 11).

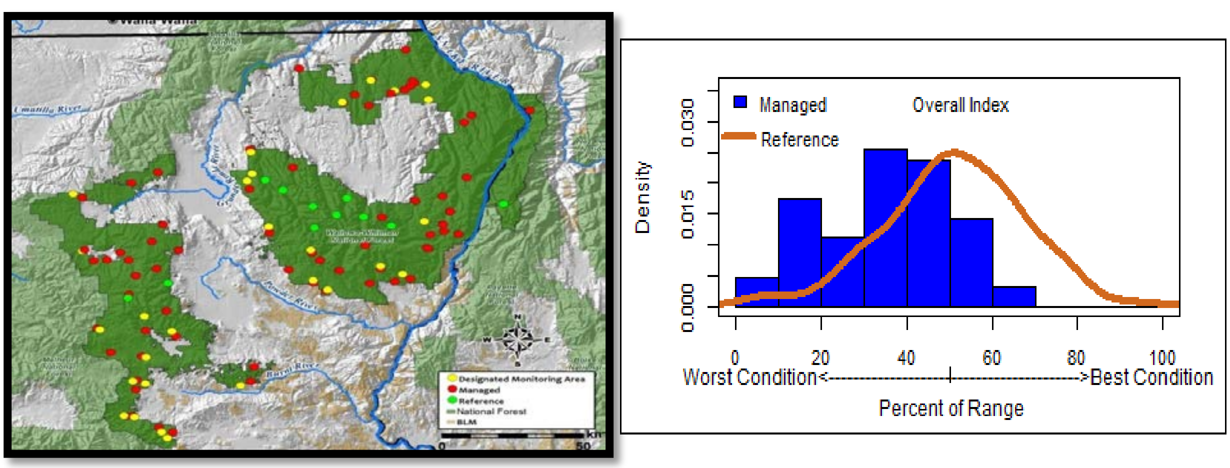

Figure 11. The distribution of stream habitat condition index scores for sites on the Wallowa-Whitman National Forest

Distributions are provided for streams in managed watersheds (blue histogram) and for expected reference conditions determined from data from minimally managed watersheds (brown line). The habitat index is an integrated score comprised of scores from multiple habitat parameters, such as substrate composition, fine sediment in pools, large wood frequency, percent pool habitat, and macroinvertebrate community composition (Al-Chokhachy et al. 2010). Scores are also available for individual habitat parameters. Reference conditions can be used to help assess how habitat conditions in a particular watershed or watersheds compare with those in the least disturbed watersheds. Consideration of natural watershed processes and human alterations of those processes is necessary to understand the reasons that those habitat conditions exist and what, if any, management actions are needed to address them.

This, together with the watershed-specific information described below, can enable analysis teams to more completely and accurately assess watershed and aquatic habitat conditions, their likely trajectories, the reasons those conditions exist (for example, natural disturbance or human impacts), what actions might be warranted in the watershed, and generally how and where they should be implemented. This two-tiered approach, involving broad-scale status and trend assessment and monitoring across many watersheds to identify spatial and temporal patterns, coupled with more detailed, process-based analysis of specific watersheds to identify the causes of these patterns and management needs and opportunities, is consistent with the recommendations of Lisle et al. (2014).

It is important to recognize that while “reference conditions” are quite useful in describing potential environmental conditions and providing a tool for diagnosing current status and trends, they may not always equate to desired conditions. First, while they may characterize the best available and perhaps the best attainable conditions based on current data and information, they do not necessarily represent natural or pristine conditions because all watersheds have been impacted by human activities to some degree (for example, fire suppression). As such, our understanding of true natural conditions is limited and may not necessarily represent natural conditions in space and in time, or those conditions may not always be desirable. Moreover, even if these natural conditions were fully understood, those conditions may not always be desirable. In addition, these conditions need to be assessed in the context of the species, issue, or process of interest to holistically understand whether deviation from reference condition is ecologically meaningful. For example, high levels of fine sediments may adversely affect developing salmonid eggs, but may support spawning lamprey.

As described by Montgomery and MacDonald (2002), in-channel data are best viewed as one set of diagnostic indicators of watershed and aquatic habitat condition. To inform management decisions, it is important to understand the reasons for these conditions and what, if any, management actions are needed to address them. This is a challenge because channel conditions are highly variable over space and time and can result from multiple pathways and processes influenced by both natural conditions and human impacts (Lisle et al. 2014). Thus, evaluation of reach-level channel data requires more than simple comparisons with data from reference sites. Such evaluations should use qualitative and quantitative data and information to characterize the current state of the system and the dominant natural and human-caused processes that control key variables of interest. This will generally involve consideration of the location of the reaches in the channel network, regional and local biogeomorphic context, controlling influences such as sediment supply and transport capacity, riparian vegetation, the supply of in-channel flow obstructions, and disturbance history (MacDonald and Montgomery 2002).

Watersheds to be Analyzed

Watershed analysis, which can be conducted at several spatial scales (subbasin to subwatershed), will be used to inform plan implementation.

In the "Management Focus" section of the forest plans, the specific subbasins (hydrologic unit code 5) are identified where the national forests have committed to updating the watershed analyses for these subbasins during the life of the forest plans.

Other candidates for watershed analysis, in addition to the potential Watershed Condition Framework priority watersheds, would be those where:

1. watersheds wherein management activities are likely to occur that may substantially affect aquatic resources (for example, due to their inherent nature, location, timing or scale),
2. watersheds wherein upslope and/or in-channel conditions (for example, per PACFISH-INFISH biological opinion data and models, Watershed Condition Framework assessment, other applicable information, or a combination of these things) are outside or at the extremes of the distribution of reference sites/watersheds, and
3. watersheds wherein the rates of change in condition (trajectories) differ substantially from the rates in the rest of the watersheds on the national forest.

The goal is to use the results of existing monitoring and assessment programs to stratify the landscape based on broad-scale, coarse-grained evaluations of watershed condition; select watersheds from that landscape for further, finer-scale, more detailed analysis of watershed conditions and processes; and use the results of those finer-scale analyses to inform management of those specific watersheds. In addition, as more analyses are completed and updated over time, results will collectively be used to further understand conditions and trends in the entire population of watersheds on the national forest. One focus of these analyses will be to determine, where applicable, why instream conditions are outside or near the tails of the distribution of reference conditions. Are these natural conditions or were they caused by past or ongoing management actions? If management-driven, what actions are needed to facilitate recovery or maintain or improve desired conditions?

Timing

As applicable, watershed analysis will be updated or conducted prior to:

- implementation of watershed restoration action plans in Watershed Condition Framework priority watersheds;
- proposed changes to riparian management area widths must be supported by a watershed analysis. It is expected that riparian management area widths will not be less than described in the designating riparian management areas section; and
- proposed timber salvage or construction of facilities in riparian management areas.

Watershed analysis is generally conducted prior to project-level National Environmental Policy Act analysis. However, watershed analyses can be conducted concurrent with the National Environmental Policy Act process in some situations. This approach may be most appropriate where watershed analyses have been completed in the past but need modest updates. It may also be appropriate for new analyses or significant updates, when the projects being planned and evaluated under the National Environmental Policy Act cover a wide range of activities over large areas and multiple years.

8. Watershed Restoration Strategy

Background

Watershed protection and restoration to benefit aquatic and riparian-dependent resources and water quality is an integral element of the Blue Mountains Aquatic and Riparian Conservation Strategy. Restoration, in concert with other Aquatic and Riparian Conservation Strategy elements, contributes to protection and recovery of those resources. Collectively, the goal of restoration and the strategy as a whole is to provide for ecologically healthy watershed, riparian, and aquatic ecosystems, as defined by the aquatic and riparian desired conditions. The phrase ecologically healthy refers to functions affecting biodiversity, productivity, biochemical, and evolutionary processes that are adapted to the environmental conditions in a given region (Karr et al. 1986; Karr 1991).

Watershed protection and restoration is designed to facilitate the recovery of watershed functions and related physical, biological, and chemical processes to promote recovery of riparian and aquatic composition, structure, and ecosystem function. Restoring the health and resiliency of selected watersheds will help ensure that the network of key watersheds remains well represented and distributed over time.

Watershed protection and restoration is a catalyst for initiating ecological recovery (FEMAT 1993). Restoration efforts will be comprehensive, addressing both protection of existing functioning aspects of a watershed and restoration of degraded or compromised aspects. It may not be possible to restore every watershed and some restoration actions may only have limited success because of an extensive level of degradation. The effectiveness of restoration efforts is not likely to be extensive or immediately visible for some time. At the watershed scale, it may take an extended period (decades or longer) to observe the full effects of treatments. Even longer timeframes may be necessary to see changes at the regional scale.

Effective restoration at the watershed scale is a complex undertaking. Restoration programs require diagnosing watershed conditions and processes, identifying primary disturbance regimes (past, present, and future), and the ability to locate, design, and implement integrated treatments to achieve the desired, watershed-scale response. To be effective, these programs need to (1) target root causes of water quality, habitat and ecosystem change; (2) tailor restoration actions to local potential of the systems; (3) match the scale of restoration to the scale of the problem; and (4) be explicit about expected outcomes (Beechie et al. 2010). The region accomplishes restoration through a whole watershed approach including internal and external partners, passive and active restoration, and prioritization, documentation of restoration needs, monitoring, and adaptive management.

Whole Watershed Approach and Partnerships

Water resources such as clean, cold water and healthy fish populations know no jurisdictional boundaries. To successfully fulfill agency responsibilities to maintain and restore these resources, work should be implemented across boundaries with willing neighbors and other partners in restoration. Restoration should be designed and implemented at the watershed scale. Treatment objectives and activities on National Forest System lands should be coordinated with other resource programs and with restoration on other ownerships. Watershed-scale restoration is an interdisciplinary effort requiring close coordination and working partnerships among multiple resource programs, other agencies, Tribal governments, watershed councils, adjacent landowners, collaborative groups, and other stakeholders and partners. Interdisciplinary skills provide both operational and technical capacity for implementing comprehensive watershed protection and

restoration programs. Coordination and partnerships are essential to effectively address community and watershed-scale restoration needs and opportunities. Coordination also enhances skill and funding sources needed to sustain multi-year programs.

Types of Restoration

Watershed restoration programs include passive and active approaches. Both are needed for a successful restoration program (Roni et al. 2002).

Passive restoration involves the protection, natural recovery, or both of watersheds and aquatic and riparian ecosystems. It is applied at the landscape scale as intended to enable ecosystems to resist and recover from large-scale disturbances, such as fire, floods, and debris flows as well as chronic disturbances. Passive restoration involves planning and implementing various resource management programs and activities (for example, fuels and timber management, recreation) in a way that maintains watershed and habitat conditions when they are in good condition and facilitates their recovery when they are not. The passive restoration is embodied in the standards and guidelines, which are design criteria that constrain management activities in an effort to maintain or improve the desired conditions.

Active restoration is active intervention with integrated project activities. It focuses on re-establishment or modification of specific ecosystem processes. Active restoration is generally applied using integrated treatments (for example, fish passage, road decommissioning and stabilization, riparian and upslope vegetation treatment, instream habitat improvement, restoration of stream flows) that are strategically applied at multiple, priority sites within a watershed. It is focused and applied on a more limited scale (for example, specific sites in key and candidate priority watersheds) than passive restoration.

Active restoration should be prioritized to emphasize the protection and/or retention of existing high-quality habitat and water and naturally functioning watersheds and ecosystems. This is accomplished by identifying and treating major risk factors (for example, unstable roads or poorly located and drained roads, certain invasive plants and animals, major obstructions to physical and biological connectivity) threatening ecosystem integrity and likely to adversely influence existing conditions. Identification, prioritization, and integrated treatment of watersheds with limited loss of function and condition are also a priority. These watersheds will likely serve as the next generation of refugia for fish and provide high-quality water in the future. Their selection should consider the extent of habitat degradation and the degree to which their natural diversity and ecological processes are retained (Reeves et al. 1995). Active restoration programs should consider and complement recovery plans for fish, water quality, and other riparian-dependent species. Watershed analyses will be critical to identify key ecological processes influencing watershed condition and function and will be important in identifying specific protection, treatment objectives, or both.

In cases where the full recovery of watershed functions and processes is not possible (for example, mixed ownerships without coordinated restoration opportunities, major dams and diversions for hydropower or other developments that influence large, important, or both portions of the floodplain or stream channel), mitigation treatments may be needed. These should incorporate design features to benefit aquatic and riparian-dependent resources.

Programmatic Framework

In 2005, the Pacific Northwest Region began implementing a regional aquatic restoration strategy (USDA Forest Service 2005), providing a framework for the organization and implementation of

restoration activities for the region. The goal of the aquatic restoration strategy is to improve watershed and aquatic and riparian habitat conditions at the regional scale, through both passive and active restoration. The aquatic restoration strategy consists of three parts: 1) goals and objectives and actions, 2) program framework, and 3) restoration components. The goals, objectives, and actions section identifies restoration goals and actions needed to achieve them. The program framework is the foundation of the strategy. It is a comprehensive, integrated restoration plan for the region, enhancing teamwork, coordination, and consistency across the program. The restoration components are groups of activities used to implement various program elements, including resource support activities, aquatic and riparian resource assessment, cooperation between State and Federal salmon and watershed recovery programs, and technical support to the field.

Implementation of the Regional aquatic restoration strategy has since been refined through the National Watershed Condition Framework. As shown in figure 8, the Watershed Condition Framework is a 6-step process for restoration, including:

1. Classifying watershed condition at the subwatershed scale;
2. Prioritizing watersheds for restoration;
3. Developing watershed restoration action plans;
4. Implementing integrated projects;
5. Tracking restoration accomplishments; and
6. Monitoring and verifying the Watershed Condition Framework process and its outcomes.

Classifying Watershed Condition

Classification of watershed condition is the first step of the Watershed Condition Framework process. This classification is based on a standardized assessment of subwatersheds (12-digit hydrologic unit) across an entire national forest, using 12 different condition indicators. Additional details are provided in the Watershed Condition Classification Technical Guide (USDA Forest Service 2011b).

Prioritizing Watersheds for Restoration

The next step in the restoration framework is prioritization. The purpose of prioritization is to maximize the efficiency and effectiveness of the restoration program by focusing resources towards work in the most important watersheds. As described in section 6, prioritization is done in two phases. First, through the forest planning process, national forests will identify a long-term key watershed network. This network is comprised of watersheds with the highest quality aquatic habitats and water and watersheds that can be most readily protected, restored, or both. These watersheds, generally 10-digit hydrologic units, are the priorities for aquatic conservation and restoration over long-timeframes (multiple decades).

Due to capacity limitations, however, watershed-scale restoration work cannot be implemented across the entire key watershed network at one time or not even during the life of a forest plan. Thus, through the forest planning process (see section 6), national forests will identify a smaller number of Watershed Condition Framework priority watersheds as the focus for near-term (5- to 7-year timeframe) restoration. Watershed Condition Framework priority watersheds are specified at the subwatershed (12-hydrologic unit) scale. In general, they are a subset of the broader, longer-term key watershed network. Exceptions include situations where unique issues and restoration opportunities occur in areas outside of the key watershed network. Watershed

Condition Framework and potential Watershed Condition Framework priority watersheds are expected to change during the life of the forest plan as restoration objectives and actions are completed. Details about how to change the candidate priority status of a watershed are provided in section 6.

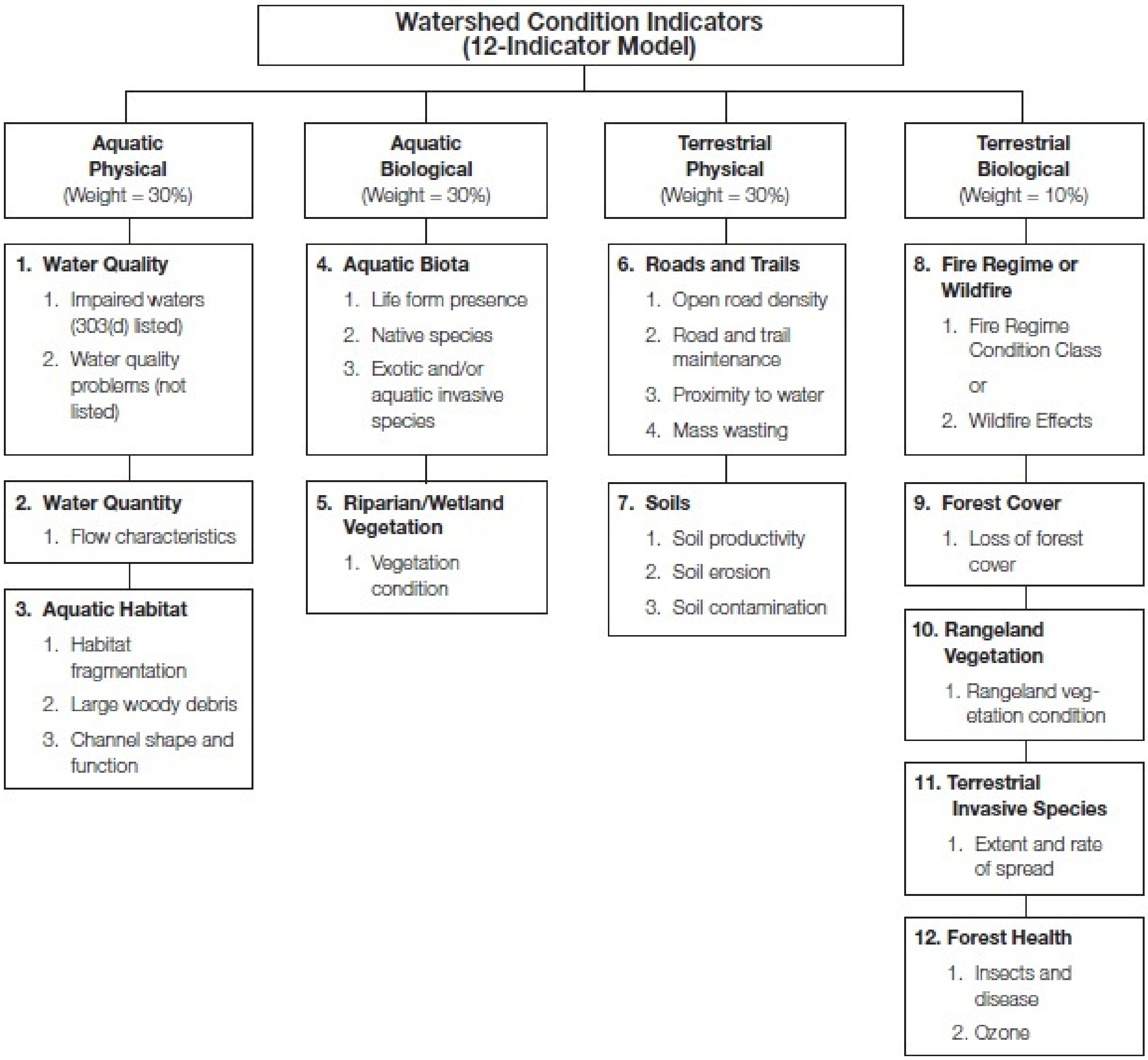

Figure 12. Twelve-indicator watershed condition model used in Watershed Condition Framework. This model is used to classify watershed conditions across all subwatersheds on each national forest. Each indicator is classified as functioning properly, functioning-at-risk, or having impaired function based on standardized rulesets.

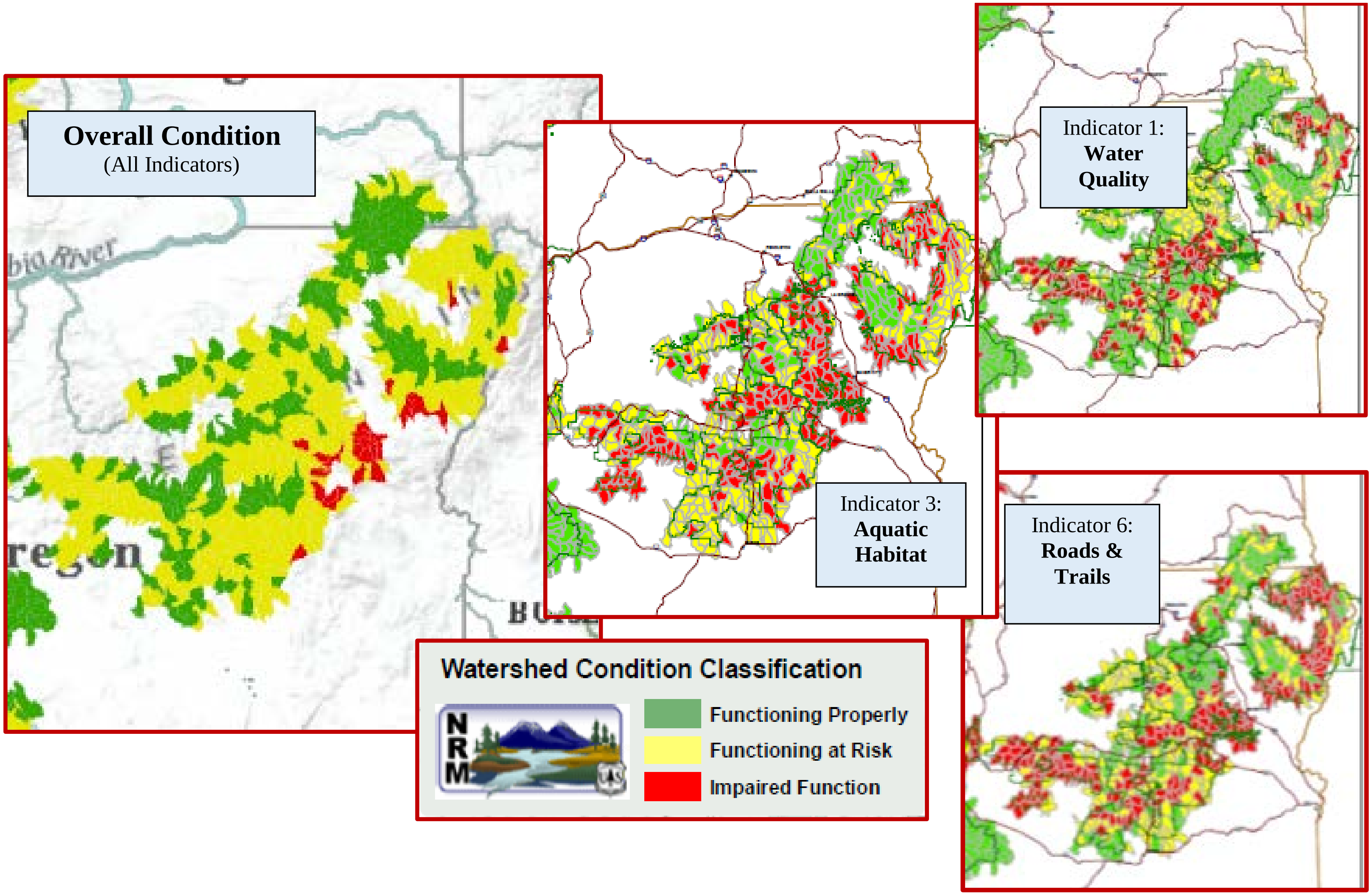

Figure 13. Overall watershed condition and the condition of three selected indicators, per the Watershed Condition Framework assessment process

Developing Watershed Restoration Action Plans

Watershed restoration in the late 1980s and 1990s often focused on site-scale actions scattered across the landscape. As the practice evolved over the last several decades, it has become increasingly clear that, to be effective, restoration programs must implement a wide range of projects that address multiple impacts and threats at a watershed scale. This needs to be done in a phased and coordinated manner (Roni et al. 2002). Thus, after identifying potential Watershed Condition Framework priority watersheds, national forests will use watershed analyses (Section 10), other assessments and monitoring to identify the full-suite of essential restoration projects needed to restore the ecological conditions and processes in those areas at a whole watershed scale. This could include restoration of fish passage barriers, road improvements or decommissioning, stream and floodplain reconstruction, dam removal, restoration of instream flows, invasive species control, vegetation management and many other actions. This suite of essential projects should be designed to achieve specific and explicit restoration goals and objectives for the watershed, address the root causes (rather than symptoms) of degradation, be fit to the local ecological potential of the watershed and ecosystem, and be of sufficient scope and scale to address these problems (Beechie et al. 2010). Moreover, identified essential restoration projects should be based on a consideration of the potential effects of climate change and the ability of restoration actions to minimize them. In particular, water availability, stream flows and stream temperature should be considered. Identified restoration project should also be informed by and generally consistent with any applicable recovery plans for federally listed aquatic species, State water quality restoration plans, or both.

Per the Watershed Condition Framework, these projects, their general location, estimated costs, interested partners, and other information will be documented in a watershed restoration action plan for each Watershed Condition Framework priority watershed. In the preparation of watershed restoration action plans, consideration shall be given to restoration actions located off National Forest System lands when those projects are essential to the restoration of the watershed and benefits national forest resources (for example, facilitating the upstream passage of rare fish species from private land onto National Forest System lands by implementing a passage project on downstream private lands).

Tracking Restoration Accomplishments

Implementation of restoration actions will be tracked for individual essential restoration projects, as identified in a watershed restoration action plan for each Watershed Condition Framework priority watershed. These will be recorded in corporate databases. In addition, once all essential projects are completed, per the Watershed Condition Framework, the watershed is considered to have been improved or restored. Similarly, this status is tracked in agency databases. Restoration project areas not specified as priority watersheds are also recorded in agency databases.

Implementing Integrated Projects that Restore and Maintain Watershed Conditions

The overall strategy is to accelerate improvement of watershed and aquatic/riparian conditions across the landscape by: (1) conducting new and ongoing management activities in a manner that, across broad scales, protects areas in good condition and allows for passive recovery of those that are degraded; and (2) actively restoring conditions at watershed scales in high-priority areas by implementing integrated, strategically-focused sets of restoration treatments that facilitate recovery of critical watershed processes.

As previously described, there are five essential elements to the Blue Mountains Aquatic and Riparian Conservation Strategy: riparian management areas, key watersheds, watershed analysis,

watershed protection and restoration, and monitoring. These elements work together to achieve a distribution of watershed conditions that are resilient to natural disturbance, that maintain, restore, and enhance habitat for resident and anadromous fish and other aquatic and riparian-dependent organisms:

- **riparian management areas** are areas bordering perennial and intermittent streams in which the management emphasis is to maintain, restore, or enhance the ecological health of aquatic and riparian ecosystems
- **key watersheds** are subwatersheds, or groups of subwatersheds, selected to serve as strongholds for important aquatic resources or that have the potential to do so
- **watershed analysis** is a procedure used within the Pacific Northwest for evaluating the geomorphic and ecological processes operating within watersheds and is used to assess the condition and trend of watershed, riparian, and aquatic ecosystems and provide the basis for watershed-scale restoration
- **watershed protection and restoration** is an integrated set of both passive and active actions intended to facilitate the recovery of the physical, biological, and chemical processes that promote the maintenance or recovery of riparian and aquatic ecosystem structure and function
- **monitoring** is a strategic assessment of the implementation and effectiveness of management actions and a means of determining whether or not progress toward achieving desired conditions is being made

Implementation of the watershed protection and restoration element is tiered to the regional aquatic restoration strategy, which uses a strategic, integrated, multi-scale approach to prioritizing watershed restoration treatments. The highest priority is to first restore critical watershed processes in those areas in which the structure and function of the aquatic ecosystem are largely intact, but are threatened by existing or projected watershed conditions. Watersheds with highly degraded aquatic ecosystems are a lower priority for restoration until threats to existing strongholds (for example, key watersheds) are mitigated.

Watershed conditions in the Blue Mountains have been altered by a series of human uses during the last 150 years, including mining, logging, agriculture, water diversions, flood control, wildfire suppression, grazing, road construction and maintenance, and hydroelectric development. The ability of watersheds to function has been affected by the alteration of vegetation conditions, increased erosion, and changes in the rates and magnitude of watershed runoff (McIntosh et al. 1994). The resulting degradation and fragmentation of aquatic and riparian habitats has led to widespread decline or outright extinction of many resident and anadromous fish stocks and the listing of several fish stocks under the Endangered Species Act in the early 1990s. Of the 214 remaining salmonid stocks identified by Nehlsen et al. (1991) in the Columbia and Klamath basins, 101 are considered at high risk of extinction. Only 2 percent of salmon, steelhead, and cutthroat trout populations in the Columbia Basin are classified as strong (Thurow et al. 2000). In the Blue Mountains, Nehlsen et al. (1991) identified 17 extinct salmonid populations:

- spring and summer Chinook salmon from the Umatilla, Walla Walla, and Malheur Rivers. Recent efforts by The Confederated Tribes and Bands of the Umatilla Indian Reservation have returned spring-run Chinook salmon to the Umatilla and Walla Walla Rivers.
- fall Chinook salmon from the Umatilla and Walla Walla Rivers

- coho salmon from the Grande Ronde, Wallowa, Tucannon, Walla Walla, Snake, and Umatilla Rivers
- chum salmon from the Umatilla and Walla Walla Rivers
- sockeye salmon from the Wallowa River
- steelhead trout from the Malheur, Powder, and Burnt Rivers

In addition, Snake River Chinook salmon and steelhead are listed as threatened under the Endangered Species Act and mid-Columbia Basin steelhead are listed as threatened. Bull trout are listed as threatened within their entire range in the western United States.

In the Blue Mountains, as elsewhere in the Pacific Northwest, remaining high-quality aquatic habitats are largely located on Federal lands but are often fragmented or disconnected from other high-quality habitats, resulting in reduced ability of aquatic species to access or move between habitats. The quality and types of available habitats may no longer encompass the range of habitats that existed historically and may not be sufficient to support the full range of life histories of affected aquatic species in some cases.

Aquatic habitats on National Forest System lands in the Blue Mountains once supported culturally and economically important populations of freshwater species, including anadromous and resident fishes (Chinook salmon, steelhead, redband trout, and bull trout), lamprey, and mussels. In most cases, declines in the populations of these species can be traced to habitat degradation (Gregory and Bisson 1997).

It is generally recognized that preservation of existing high-quality habitats and remaining strong populations is critical to the continued survival of anadromous and resident fish populations (Reeves et al. 1995). In addition, restoration efforts should focus on restoring the key ecological functions responsible for the creation and maintenance of aquatic and riparian habitats in order to make those ecosystems self-sustaining (Beechie and Bolton 1999, Naiman et al. 1992).

The focus of watershed restoration is to complete needed restoration work from ridgetop to valley bottom in order to have healthy watersheds. It should be recognized that not all watersheds will be in good condition at the same time and that the condition of some existing high-quality watersheds will eventually be degraded by future disturbance and that replacement habitats will be needed for some populations of aquatic and riparian species (Reeves et al. 1995).

Because of the extent of decline in populations of some aquatic species and the degradation of their habitats, protection of remaining strong populations and their habitats is crucial to their recovery (Sedell et al. 1997). A network of key watersheds is identified in order to meet this need. Key watersheds have a combination of relative population strength for one of four aquatic species (Chinook salmon, steelhead, inland redband trout, and bull trout), good watershed conditions, and good aquatic and riparian habitat condition (Reiss et al. 2008). Key watersheds are identified at the subwatershed level (U.S. Geological Survey, HUC 6; Federal Geographic Data Committee 2009).

Some of the attributes of key watersheds that make them important for aquatic species may also make Key Watersheds important habitats for terrestrial wildlife species. Key watersheds may encompass a variety of habitats important to various wildlife species, including source habitats, summer range, winter range, refugia, and migration corridors. In addition, key watersheds are likely to be less affected by past land uses and are therefore more likely to be important to the maintenance of water quality and quantity for a variety of downstream uses, including human uses.

The overall strategy is to protect and restore whole watersheds, while reducing risk to remaining populations of aquatic species and increasing the availability and connectivity of high quality aquatic and riparian habitats. Watersheds in good condition should be preserved by reducing existing impacts, implementing best management practices, and through more comprehensive project design. Watershed protection and restoration activities will be prioritized so that investments are made in areas that have the highest restoration potential while providing the greatest benefit to multiple resources and the least risk to existing populations. These areas are identified as potential Watershed Condition Framework priority watersheds in the project record. Restoration actions may take place in areas of lower priority as circumstances warrant and as opportunities are presented.

Land managers should recognize and seek to restore the processes responsible for creating and maintaining aquatic and riparian habitats, as well as the diversity of those habitats. This may include, but is not limited to:

- altering the structure and composition of upland vegetation in order to make progress toward achieving desired conditions
- managing vegetation to reduce wildfire risk and restore stand structure and resiliency
- reducing road-related erosion and sediment delivery to streams through road closure, road obliteration, improved maintenance, improved erosion control, or a combination of these things
- removing barriers that block or restrict access to historically occupied habitats or restrict connectivity between habitats
- altering riparian habitats to favor deciduous trees and shrubs as appropriate where such species were formerly abundant
- reintroducing keystone species, such as beaver, into suitable habitats within their former range
- Increasing the diversity and complexity of aquatic and riparian habitats by promoting natural establishment and succession of riparian plant communities
- Restoring the natural range of stream flows to the extent possible
- Managing invasive species to maintain the composition and diversity of native species
- Restoring complexity and aquatic and riparian habitat
- Adapting management actions to account for the expected effects of climate change

Key watersheds are located in each of the 15 subbasins with streams originating on National Forest System lands. Sixty-seven subwatersheds that are considered the highest priority for restoration have restoration work that either is ongoing or is expected to begin within the next 15 years. The full list of key watersheds, including maps, is available from the project record.

Once a watershed restoration action plan is developed, essential restoration projects are implemented in a logical, phased, and coordinated way. For example, restoration of habitat connectivity is often one of the first restoration actions that should be completed in a watershed (Roni et al. 2002). Conversely, if road decommissioning is needed in a watershed, it should be conducted after any other critical work that is dependent on those particular roads is complete.

As described previously, restoration projects will be done in an interdisciplinary manner in close coordination with other agencies, Tribal governments, watershed councils, adjacent landowners, collaborative workgroups, other stakeholders and partners.

9. Monitoring

This section outlines a consistent monitoring framework for the Blue Mountains Aquatic and Riparian Conservation Strategy, at the broad scale and the forest plan level. This framework is focused on enabling managers to make informed, sound decisions by addressing key questions and reducing uncertainties at multiple scales. It is composed of an ongoing cycle of planning and implementing activities, monitoring through collection of data by observation or measurement, evaluation of those data, and subsequent adjustments in the overall process. Some components of broad-scale monitoring will be implemented by the regional office, whereas others will involve both regional and national forest-level activities. Importantly, as described below, the broad-scale and forest plan guidance of this framework are intended to efficiently work together and inform one another. Moreover, this monitoring is strongly linked with watershed analysis components of the Blue Mountains Aquatic and Riparian Conservation Strategy (section 10).

Reflecting the principles of the RIEC Framework (2011) and Interior Columbia Basin Strategy (2014), this monitoring framework focuses on using monitoring to answer the following key questions:

- Are plans being implemented correctly?
- Are plans and activities effective in achieving desired results?
- What is the status and trend of watersheds, water quality, aquatic and riparian resources?
- Are underlying assumptions of the plans valid?

In addition, this monitoring framework provides a mechanism for accountability and oversight and provides a feedback loop, so that management direction, activities, or both can be evaluated and modified at multiple spatial (project-level to regional) and temporal scales (years to decades or more) by decisionmakers at different levels of the agency (district ranger to regional forester).

This framework uses a multi-scale approach because:

1. the Aquatic and Riparian Conservation Strategy and forest plan components (for example, desired conditions, objectives, standards and guidelines) cover a broad range of spatial and temporal scales,
2. the condition of watersheds and aquatic and riparian habitats is influenced by numerous processes operating at a similarly large range of scales,
3. the sensitivity to disturbance of different ecosystem components varies widely across those scales, and 4) monitoring feedback needs to be taken by different people at different administrative levels over varying timeframes.

Monitoring, Verification, and Feedback in Restoration

Monitoring and verification coupled with feedback loops are essential to ensuring the success of restoration. As such, national forests will actively respond to monitoring by course adjusting the approach to restoration and other actions as foundational components of their restoration programs, as described in this section. The monitoring plans incorporate combination of implementation, effectiveness, and validation monitoring. Specifically, there will be both

Watershed Condition Framework monitoring and broad-scale monitoring that will feed into the monitoring plans directly. Information gained from monitoring will be shared to facilitate mutual learning.

Watershed protection and restoration is founded in science. As such, there is a continuous stream of contributions to the body of knowledge. Restoration techniques should be implemented, monitored, and subsequently modified to reflect what was learned through monitoring. Information from monitoring enters a feedback loop, improving future restoration actions (Roni et al. 2002). Reporting, publishing, and disseminating the success or failure of restoration projects will not only help a particular ranger district or national forest personnel learn but will assist others within and outside the agency, adding to the restoration community's knowledgebase.

Implementation, Effectiveness and Validation Monitoring

There are three types of monitoring: implementation, effectiveness and validation monitoring. The following defines those terms as they are referred to in the revised forest plans.

Implementation monitoring is simply documenting that a project has been conducted and/or conducted according to specific design criteria (for example, best management practices). For example, when an aquatic organism project is implemented, the action would be documented in the regional barrier database, so the national forest and regional personnel can track accomplishments.

Effectiveness monitoring evaluates how effectively a project met its intended goal. For example, when an aquatic organism project is implemented, effectiveness monitoring would evaluate whether previous impacts to stream channel structure and function have been eliminated or reduced (for example, does the crossing simulate a natural stream channel?). Costs for effectiveness monitoring should be included in project budgets.

Validation monitoring, generally the most expensive form of the three monitoring approaches, validates assumptions made in effectiveness monitoring. Because of its generally higher cost, validation monitoring is usually performed on a small subset of the overall number of projects. This level of experimental design would generally be conducted with Forest Service research, universities, or other research organizations.

Validation monitoring is intended to verify the following question: "Are correctly implemented projects yielding the effectiveness monitoring we anticipated?" If the answer is "no", then the agency is committed to validation monitoring as a way to rigorously assess the validity of our assumptions. Validation monitoring would be an outcome of our implementation and associated effectiveness monitoring. Validation monitoring would only be developed as needed to address specific concerns. It would be conducted the least frequently of all monitoring activities, given the relatively large cost and long timeframes to address these types of questions. Currently, no specific validation monitoring questions have been identified as priorities to address via broad-scale or regional monitoring.

Potential adaptive management actions would usually be taken by the regional forester. They would generally focus on significant issues occurring over broad areas (for example, millions of acres). Actions could include changes to this strategy, direction to national forest personnel to develop new plan direction or adjust approaches to implementing current plan direction, and adapting or replacing inaccurate analysis models.

Broad-scale and Forest Plan Implementation-scale Monitoring

Monitoring under this planning effort will occur at both broad and plan implementation scales.

Broad-scale Monitoring

Broad-scale monitoring would generally be authorized and funded by the regional forester. This type of monitoring would generally focus on significant issues occurring over broad areas (many national forests). Actions could include development or refinement of regional policies and procedures, training and functional assistance trips to national forests, and direction to national forest personnel to focus additional resources towards certain activities. These actions would generally occur over short to medium time-scales (for example, one to 5 years).

Additional effectiveness monitoring will be conducted on a prioritized ad-hoc basis. Current broad-scale effectiveness monitoring activities are focused on evaluating the effectiveness of road restoration in reducing the hydrologic and geomorphic impacts of roads and improving habitat connectivity at road-stream crossings.

The following regional monitoring programs will be used to address this question:

- Aquatic and Riparian Effectiveness Monitoring Program (AREMP), in western Oregon and Washington and northern California
- PACFISH/INFISH biological opinion monitoring program in the Interior Columbia River Basin

While the precise methods used by these programs differ somewhat, they generally involve the collection, gathering, and evaluation of data regarding upslope watershed conditions and instream aquatic habitat conditions.

The PACFISH-INFISH biological opinion monitoring is a long-term monitoring program designed to support implementation and effectiveness monitoring in the Interior Columbia Basin particularly with regards to instream habitat and riparian condition (figure 14) and (figure 15).

Figure 14 shows the current status of stream habitat conditions via an overall habitat index (Archer and Ojala, 2016 using the approach of Al-Chockhachy et al. 2010). Table 7 shows trends in the overall habitat overall index as well as for individual habitat metrics. Cells highlighted in grey show metrics that have statistically significant changes in the desired direction (+ or -). Metrics in the unshaded cells have changed in the desired direction, but the changes are not statistically significant. Metrics shown in green have changed in the direction opposite of what is desired, but those changes are not significant. Metrics shown in light red have changed in the direction opposite of what is desired, but those changes are not significant. Future monitoring will continue to evaluate status and trends in managed and reference condition watersheds.

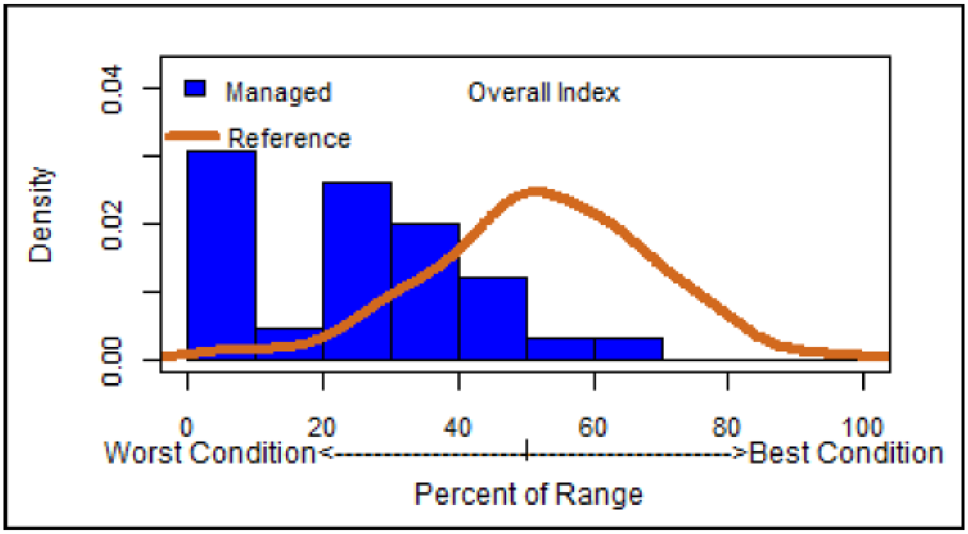

Figure 14. Status and trends of stream habitat conditions on the Malheur National Forest, 2001-2012

Table 7. Desired and actual changes in overall and individual habitat

Metric	Desired Change	Actual Change (%)
Overall habitat index	+	+8.8
Macroinvertebrates	+	+3.3
Streambank stability	+	+5.2
% undercut streambanks	+	+16.4
Large wood frequency	+	+34.1
Bank angle	-	-2.6
% fines in pool tails	-	+1.8
Median substrate size (D50)	+	+9.3
Residual pool depth	+	+10.2
% pools	+	-4.7

Use of long-term monitoring, such as that in the PACFISH-INFISH biological opinion, support adaptive management actions that would generally be taken by local line officers (district rangers or forest supervisors). Use of these datasets could include increasing or decreasing the type, scope, scale or location of different activities (for example, watershed restoration, timber harvest, road building or decommissioning, fuels treatment, livestock grazing) or the implementation of other plan components (for example, standards and guidelines). These actions would generally occur over moderate to long time-scales (for example, a decade or more).

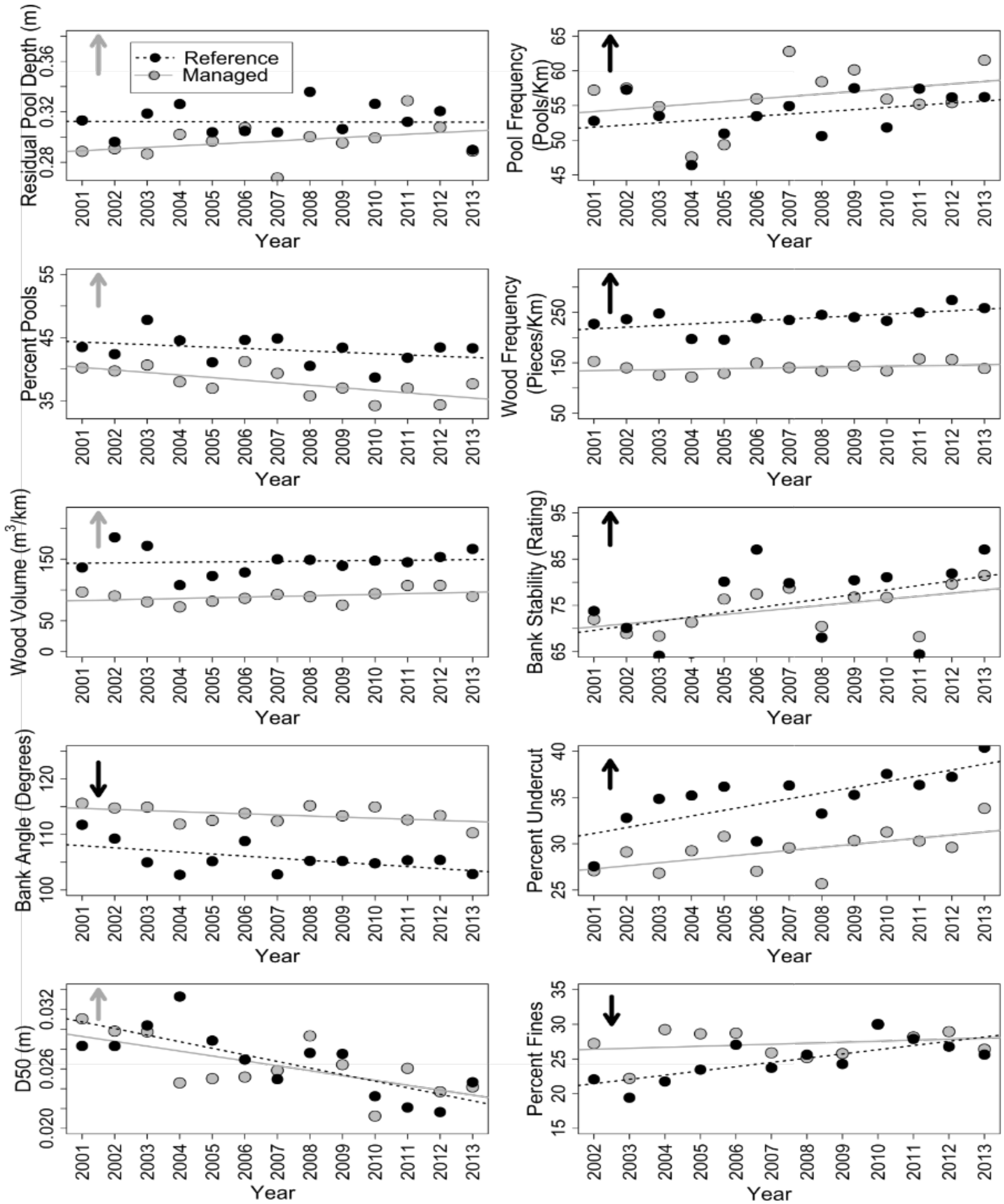

Figure 15. Trends in habitat conditions in reference and managed watersheds on Federal lands in the interior Columbia Basin, 2001-2012 (Roper et al. 2016). Arrows point to the direction of desired conditions based on PACFISH-INFISH riparian management objectives (black) or the literature (grey).

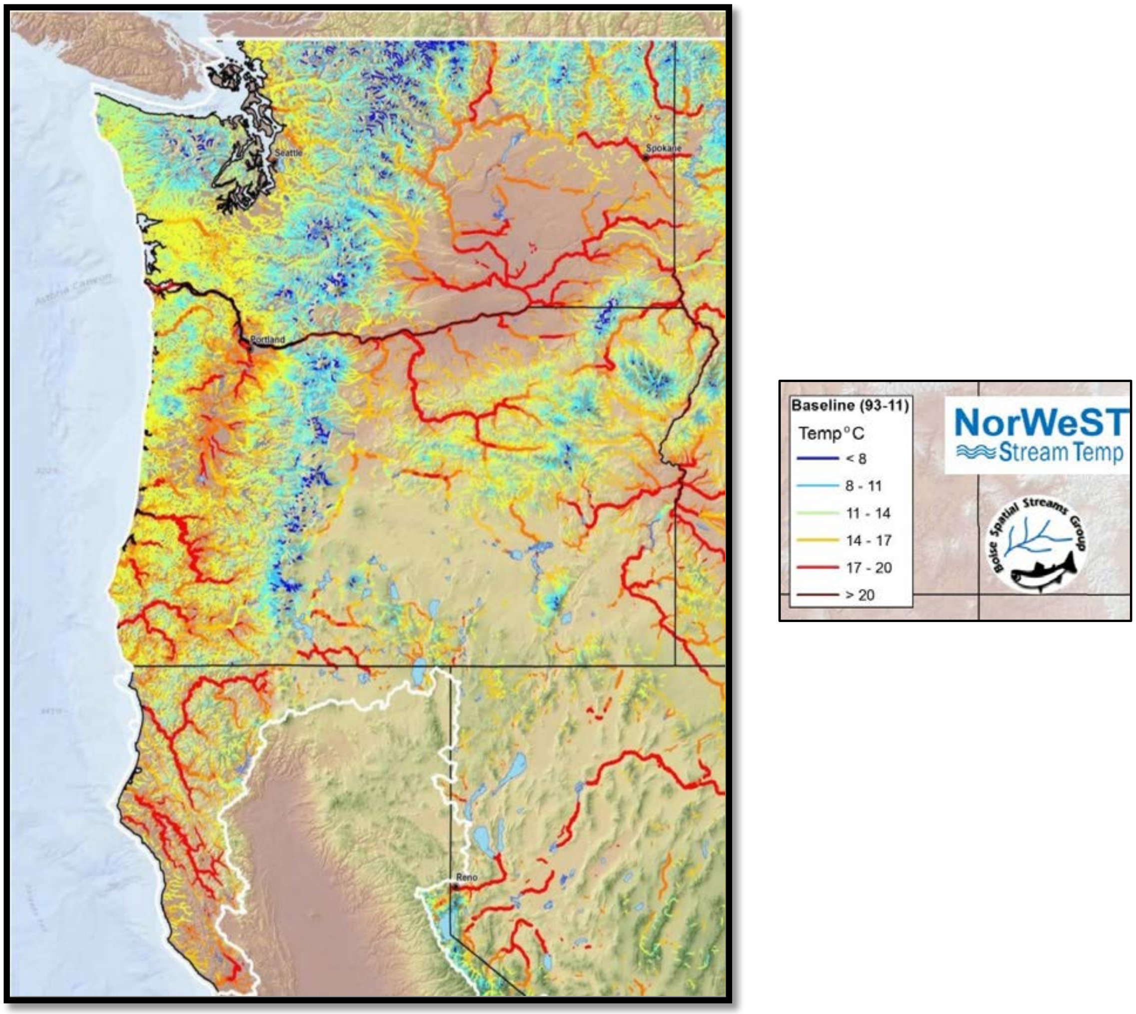

Figure 16. Spatial distribution of average August stream temperatures for the 1993-2001 baseline period. Ongoing monitoring by National Forests, other Federal agencies, States, Tribes and non-governmental organizations will enable similar products to be developed in the future, so that temporal trends can be characterized.

Forest Plan Implementation Monitoring

Implementation monitoring is intended to comply with the 2012 Planning Rule. The forest plan monitoring that correlates most directly to the Blue Mountains Aquatic and Riparian Conservation Strategy is also responsive to the 2012 Planning Rule 219.12.a.5, elements i through iv, vi, and vii (attachment A):

i. status of watershed conditions.
ii. status of select ecological conditions
iii. status of ecological conditions (see 219.9) related to threatened and endangered, candidate, and conservation concern species
iv. status of surrogate species (related to 219.9 Diversity)
v. changes due to climate change and other stressors
vi. progress toward meeting desired conditions and objectives, including multiple use opportunities.

Implementation may happen at the ranger district scale, national forest scale, or both. Implementation monitoring would measure the effects of various activities such as, watershed restoration, timber harvest, grazing, road building, decommissioning, or fuels treatment.

Linkage between Monitoring, Watershed Analysis and Restoration

The products of broad-scale status and trend monitoring will be used as part of watershed analysis for specific watersheds. Analysis teams will, for example, use those data to characterize how upslope and instream conditions and trends for a particular watershed fit within the distribution of conditions and trends across all reference and managed watersheds within a larger area (for example, subbasin, basin, national forest). From there, they will identify and use other information for the watershed of interest to more completely and accurately assess watershed and aquatic habitat conditions, the reasons (cause and effect) those conditions exist (for example, natural disturbance or human impacts), what actions might be warranted in the watershed and generally how and where they should be implemented. They may also choose to develop attributes of watershed-specific desired conditions based, in part, on products from broad-scale monitoring.

Second, the watershed condition assessment, associated with the watershed condition framework, serve as a coarse form of long-term monitoring. These assessments will be completed on a regular timeframe and before each plan revision, for use by analysis teams to determine changes in watershed condition and species viability between plan revisions. This information can be used to inform future plan development, revisions or amendments, as well as specific watershed restoration planning.

10. Coordination and Cooperation

Internal and external coordination and cooperation is essential to ensure successful management of waters and their associated riparian areas and biota. As such, Forest Service personnel collaborated with representatives from other Federal, State, and local agencies, Tribal Nations, and organizations to develop the Blue Mountains Aquatic and Riparian Conservation Strategy. Additionally, Forest Service watershed and fisheries professionals collaborate with each other and with colleagues within and outside the agency to accomplish management goals for aquatic and riparian habitat. Forest Service professionals work with neighboring landowners, representatives of other Federal, State, and local agencies, Tribal Nations, organizations, and individuals to cooperatively manage watersheds across ownership boundaries. Sharing personnel and resources is essential to successful borderless whole watershed management.

Considering limited personnel and funding, collaboration between agencies with a role in the management of fish and wildlife resources is necessary for any of the agencies to fulfill their mission. This has always been true, but has become a necessity today as science continues to illuminate the complexities of the management of water quality and fish and wildlife species within the ecosystems in which they occur. Management actions such as rare species management, habitat restoration, stocking, harvest, and invasive species control and eradication require collaboration. As such, Forest Service personnel will continue to collaborate with other agencies, organizations, and Tribal Nations with the development and implementation of conservation agreements and strategies. Forest Service personnel will continue to cooperate with Federal, Tribal, and State fish management agencies to identify and eliminate impacts associated with habitat manipulation, fish stocking, harvest, and poaching that may threaten the continued existence and distribution of native fish stocks occurring on Federal lands. Forest Service personnel will cooperate with State and Tribal agencies when aquatic invasive species eradication projects are proposed. Forest Service personnel will also coordinate and cooperate with State

water and water quality management agencies to better align and integrate programs and ensure compliances with applicable laws and regulations.

11. Risks and Uncertainties

As with any strategy designed to protect and restore ecosystems, it is uncertain whether either the Regional Aquatic and Riparian Conservation Strategy or the Blue Mountains Aquatic and Riparian Conservation Strategy will achieve the outlined goals. There are risks that it may not. These risks and uncertainties stem from several key factors. First, the knowledge base is incomplete regarding these highly complex systems. These knowledge gaps mean that the strategies may be missing key components. Moreover, the effectiveness of some existing aspects of the strategy has not been fully demonstrated. For instance, there are few examples of successful restoration at the scales of interest (typically watershed or subbasin, over long timeframes). At the same time, new threats, such as climate change and invasive species, have emerged and substantially increased risks to and uncertainties associated with aquatic ecosystems.

Besides risks and uncertainties associated with the composition of the Aquatic and Riparian Conservation Strategy, full implementation of the strategy is not guaranteed. For example, implementation is strongly dependent on budgets and a robust, highly skilled workforce with access to extensive resource information. Capacity in the region has declined substantially in the past 20 years and future declines are possible. Another key source of risk and uncertainty is the fact that the Aquatic and Riparian Conservation Strategy pertains only to National Forest System lands in the Pacific Northwest Region and portions of the Pacific Southwest Region. It does not apply to habitat impacts (including dam operations) and biological impacts (including the introduction of non-native fish) off national forests or activities on other Federal lands and State and private lands. These activities have had, and will continue to have, a large influence on the maintenance and recovery of aquatic ecosystems and water quality.

12. Conclusion

This strategy is designed to maintain and restore the ecological health of watersheds and aquatic and riparian ecosystems on National Forest System lands throughout the Blue Mountains national forests. It is part of a single, unified strategy that synthesizes, integrates, and refines the existing strategies in the region: PACFISH and INFISH. Consistent with these existing strategies, the goal of the Blue Mountains Aquatic and Riparian Conservation Strategy is to develop networks of properly functioning watersheds supporting populations of fish, other aquatic and riparian-dependent organisms, and State-designated beneficial uses of water across the Region while enabling provision of ecosystem services for multiple uses, including outdoor recreation, range, timber, and wildlife.

This strategy adopts and builds upon the basic structure and elements of existing strategies because science supports their general framework and assumptions; they appear to be working; and there is general public support for them. However, it includes some specific refinements to provide better alignment with recent science and information and new policy direction, particularly the 2012 Planning Rule as pertains to monitoring. It also incorporates lessons learned during 20-years of implementing those strategies. The Blue Mountains Aquatic and Riparian Conservation Strategy provides the plan components (for example, desired conditions, suitability, objectives, and standards and guidelines) and other plan content to guide watershed, aquatic and riparian resource management.

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12. Acronyms

ARCS	Aquatic and Riparian Conservation Strategy
AREMP	Aquatic and Riparian Effectiveness Monitoring Program
BLM	Bureau of Land Management
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DC	Desired Condition
FACTS	Forest Service Activity Tracking System
FEMAT	Forest Ecosystem Management Assessment Team
GIS	Geographic Information Systems
GTR	General Technical Report
HUC	Hydrologic Unit Code
ICS	Interagency Coordinators Subgroup
INFISH	Inland Native Fish Strategy
INFRA	Infrastructure Database
ISAB	Independent Scientific Advisory Board
KWS	Key Watersheds
MAL	Malheur National Forest
MVUM	Motor Vehicle Use Map
NMFS	National Marine Fisheries Service
NHD	National Hydrologic Data Set
NRIS	National Resource Information System
OR DEQ	Oregon Department of Environmental Quality
PACFISH	Pacific Anadromous Fish Strategy
PIBO	PACFISH-INFISH Biological Opinion Monitoring Program
PNW	Pacific Northwest Region
RIEC	Regional Interagency Executive Committee
RMA	Riparian Management Area
RMO:	Riparian Management Objective
UMA	Umatilla National Forest
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WA DOE	Washington Department of the Environment
WCF	Watershed Condition Framework
W-W	Wallowa-Whitman National Forest

13. Glossary

Anadromous fish: Fish that spend their early life in freshwater, move to the ocean to mature, and then return to freshwater to reproduce.

Anchor population*:* Population stronghold, source for supplementing or refounding smaller, more vulnerable surrounding populations.

Active floodplain: Active floodplain is defined as the area bordering a stream inundated by flows at a surface elevation defined by two times the maximum bankfull depth (measured at the thalweg).

Active Restoration: The deliberate activities related to restoration. As an example, this might include seeding native grasses and planting native scrubs and trees.

Assessment: The identification and evaluation of existing information to support land management planning. Assessments are not decision-making documents, but provide current information on select topics relevant to the plan area, in the context of the broader landscape (2012 Planning Rule).

Aquatic (and riparian) health: Aquatic and riparian habitats that support animal and plant communities that can adapt to environmental changes and follow natural evolutionary and biogeographic processes. Healthy aquatic and riparian systems are resilient and recover rapidly from natural and human disturbance. They are stable and sustainable, maintaining their organization and autonomy over time, and are resilient to stress. In a healthy aquatic/riparian system, there is a high degree of connectivity from headwaters to downstream reaches, from streams to floodplains, and from subsurface to surface. Floods can spread into floodplains, and fish and wildlife populations can move freely throughout the watershed. Healthy aquatic and riparian ecosystems also maintain long-term soil productivity. Mineral and energy cycles continue without loss of efficiency. (https://www.fs.fed.us/r6/icbemp) [section 1]

Aquatic ecosystem: Any body of water, such as a stream, lake or estuary, and all organisms and nonliving components within it, functioning as a natural system. (https://www.blm.gov/or/plans/wopr/exrmp/coosbay/glossary.html)

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act (1980).

Channel migration zone: The area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings. Channel migration zones are those areas with a high probability of being subject to channel movement based on the historic record, geologic character and evidence of past migration. It should also be recognized that past action is not a perfect predictor of the future and that human and natural changes may alter migration patterns. Consideration should be given to such changes that may have occurred and their effect on future migration patterns.

Coarse filter management: Land management that addresses the needs of all associated species, communities, environments and ecological processes in a land area (see fine filter management.) (FS People's Glossary of Eco Mgmt Terms).

Connectivity: The arrangement of habitats that allows organisms and ecological processes to move across the landscape. Patches of similar habitats either are close together or linked by corridors of appropriate vegetation. The opposite of fragmentation. (https://www.fs.fed.us/r6/icbemp) [p. 33]

Connectivity (of habitats): The degree in which habitat patches are connected.

Decommission: To remove those elements of a road that reroute hillslope drainage and present slope stability hazards. Another term for this is "hydrologic obliteration." FEMAT glossary

Desired Conditions: Descriptions of specific social, economic, and ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined but do not include completion dates.

Ecological health: The state of an ecosystem in which processes and functions are adequate to maintain diversity of biotic communities commensurate with those initially found there. FEMAT glossary

Ecosystem health: A condition where the parts and functions of an ecosystem are sustained over time and where its capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met. (https://www.fs.fed.us/r6/icbemp)

Evolutionary significant unit (ESU): a group of salmon or trout populations that is a distinct population segment. Scientists established two criteria for evolutionary significant units: 1) the population must show substantial reproductive isolation; and 2) there must be an important component of the evolutionary legacy of the species as a whole.

Facultative plants: Plants that occur usually (estimated probability more than 67 percent to 99 percent) in wetlands, but also occur (estimated probability 1 percent to 33 percent) in nonwetlands (USCOE Wetlands Delineation Manual).

Federally listed species: species listed by a Federal agency as threatened or endangered as per the requirements of the Endangered Species Act.

Fine-filter management: Management that focuses on the welfare of a single or only a few species rather than the broader habitat or ecosystem (see coarse filter management). (FS People's Glossary of Eco Mgmt Terms)

Forest road or trail: A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization (Title 36, Code of Federal Regulations, Part 212—Administration of the Forest Transportation System, section 212.1.)

Fresh water: Water that generally contains less than 1,000 milligrams-per-liter of dissolved solids (EPA glossary).

Geographic areas: Spatially contiguous land areas identified within the planning area. A geographic area may overlap with a management area.

Guidelines: Constraints on project and activity decision-making that allows for departure from its terms, so long as the purpose of the guideline is met (36 CFR 219.15(d)(3)). Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Herbicide: A chemical pesticide designed to control or destroy plants, weeds, or grasses (EPA glossary).

Hyporheic zone: The hyporheic zone is a region beneath and lateral to a streambed, where there is mixing of shallow groundwater and surface water. The flow dynamics and behavior in this zone

(termed hyporheic flow) is recognized to be important for surface water/groundwater interactions, as well as fish spawning, among other processes.

INFISH: Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest Regions (Forest Service). (https://www.fs.fed.us/r6/icbemp)

Insecticide: A pesticide compound specifically used to kill or prevent the growth of insects (EPA glossary).

Landscape: A collection of biophysical elements and ecosystem types that occupy relatively large (100,000 to 10,000,000 acres) contiguous areas (Hunter 1996, Concannon et al. 1999).

Leasable minerals: Minerals that may be leased to private interests by the Federal government. Leasable minerals include oil, gas, geothermal resources, and coal. FEMAT glossary

Long-term recovery: Amount of time needed to achieve desired conditions for watershed function (overall properly functioning watershed conditions), through natural processes, in the absence of management. This maximum timeframe at minimum shall not be slowed by management action, and may be accelerated as a consequence of management action. Overall, positive effects of a project on watershed function would be projected to last as long, or longer, than the duration of short-term adverse effects and continue to promote recovery of natural watershed function and processes overall once short-term adverse effects are no longer occurring.

Maintain: To produce no change in the existing conditions of a resource relative to their condition status; that is, properly functioning, functioning at risk, or not functioning properly. Conditions that are maintained are neither restored nor degraded, but remain essentially the same as the existing condition. The term "maintain" can apply to any condition indicator at the appropriate scale, but those scales need to be identified. Degrade applies when actions change the existing condition to one that is measurably worse.

Management areas: Land areas identified within the planning area that has the same set of applicable plan components. A management area does not have to be spatially contiguous.

Meta-population: A population comprising local populations that are linked by migrants, allowing for recolonization of unoccupied habitat patches after local extinction events. FEMAT glossary

Mitigation: Modifications of actions taken to:

- avoid impacts by not taking a certain action or parts of an action;
- minimize impacts by limiting the degree or magnitude of the action and its implementation;
- rectify impacts by repairing, rehabilitating, or restoring the affected environment;
- reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or,
- compensate for impacts by replacing or providing substitute resources or environments.

Municipal supply watershed: A watershed that serves a public water system as defined in the Safe Drinking Water Act of 1974, as amended (42 U.S.C. section 300f, et seq.); or as defined in state safe drinking water statutes or regulations.

Natural range of variation: The variation of ecological characteristics and processes over scales of time and space that are appropriate for a given management application. In contrast to the

generality of historical ecology, the natural range of variation concept focuses on a distilled subset of past ecological knowledge developed for use by resource managers; it represents an explicit effort to incorporate a past perspective into management and conservation decisions (adapted from Weins et al. 2012). The pre-European influenced reference period considered should be sufficiently long, often several centuries, to include the full range of variation produced by dominant natural disturbance regimes such as fire and flooding and should also include short-term variation and cycles in climate. The natural range of variation is a tool for assessing the ecological integrity and does not necessarily constitute a management target or desired condition. The natural range of variation can help identify key structural, functional, compositional, and connectivity characteristics, for which plan components may be important for either maintenance or restoration of such ecological conditions.

Objectives: Concise, measurable, and time-specific statements of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets.

Obligate species: A plant or animal that occurs only in a narrowly defined habitat such as tree cavity, rock cave, or wet meadow. FEMAT glossary

PACFISH: Interim Strategies for Managing Pacific Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California.

Passive Restoration: Allowing a site to self-restore through natural processes

Pesticide: Substances or mixture there of intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant (EPA glossary).

Priority watershed: A subset of key watersheds. There are two types of priority watersheds, one that applies to the Watershed Condition Framework and the other that applies to the plan period, known as potential Watershed Condition Framework priority watersheds, both are 12-digit hydrologic unit watersheds. The watersheds have been established under the agency's Watershed Condition Framework process as the focus for investments in the short term (5 to 7 years) for maintenance or improvement of watershed conditions (soil and hydrologic functions supporting aquatic ecosystems). An overview of the framework and reference materials can be found here: Watershed Condition Framework overview. The potential priority watersheds were identified with regards to those areas that will receive restoration emphasis during the plan period (15 years).

Recovery unit: A management subunit of a Federal Endangered-Species-Act-listed entity, geographically or otherwise identifiable, that is essential to the recovery of the entire listed entity. It conserves genetic or demographic robustness, important life history stages, or other feature for long-term sustainability of the entire listed entity. Recovery criteria for the listed entity should address each identified recovery unit. Every recovery unit must be recovered before the species can be delisted.

Recovery plans: Plans describing the steps needed to restore a species to ecological health.

Reference condition: A set of selected measurements or conditions of unimpaired or minimally impaired waterbodies characteristic of a water body type in a region. A standard or benchmark for a river monitoring program that measures physical and/or biological integrity.

Refugia: Locations and habitats that support populations of organisms that may be limited to small fragments of their previous geographic range (i.e., endemic populations). FEMAT glossary

Resilience: The ability of an ecosystem to maintain diversity, integrity, and ecological processes following a disturbance. (FS People's Glossary of Eco Mgmt Terms)

Resiliency: The degree to which the system can be disturbed and recover to a state where processes and interaction function as before (Holling 1973 in Reeves et al. 1995).

Resilient: (1) The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. (2) In human communities, refers to the ability of a community to respond to externally induced changes such as larger economic or social forces. (https://www.fs.fed.us/r6/icbemp)

Restore: Generally applies when the existing conditions are outside the range of desired conditions and actions are specifically designed and implemented to move toward desired conditions for one or more at-risk or impaired resources in a watershed.

Retard attainment: Applies when management action effects, individually or in combination with other management actions or natural disturbances, measurably slows the natural rate of recovery towards the desired conditions.

Riparian-dependent resources: Resources that are dependent upon the habitat conditions (cool, shady, moist) that occur in riparian areas. See 2526.05 – Definitions.

Riparian ecosystem: An ecosystem that is a transition between terrestrial and aquatic ecosystems. It includes the vegetation communities associated with rivers, streams, lakes, wet areas and their associated soils that have free water at or near the surface. An ecosystem whose components are directly or indirectly attributed to the influence of water (https://www.fs.fed.us/r6/icbemp).

Riparian habitat: Areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands.

Salable minerals: High volume, low value mineral resources, including common varieties of rock, clay, decorative stone, sand, and gravel. FEMAT glossary

Short-term adverse effects: Duration and spatial extent of adverse effects to individual parameters and overall watershed condition, relative to natural rates at which desired conditions for watershed function in the watershed would otherwise be achieved, would be determined by the project hydrologist or fish biologist. Short-term adverse effects may occur when their implementation would either immediately or eventually help create improved watershed functions and conditions that would inherently last longer than the duration of the short-term adverse effects and become relatively self-sustaining through natural processes in the absence of continued management activity. Determining short-term effects to individual parameters for the sake of long-term recovery of overall watershed function will need to be determined project-by-project based on best-available science and professional judgement by hydrology and fisheries specialists.

An example of short-term adverse effects that would not be detrimental to longer-duration watershed function would be when elevated sediment inputs and accumulation associated with a project site would be expected to fully flush out during the first fall, winter, or spring high flows after project completion, and site restoration conservation measures would be expected to prevent future project related sediment inputs into the stream (National Marine Fisheries Service 2013).

Clean Water Act total maximum daily loads for temperature and sediment, where they exist, also help define short-term adverse effects for specific watersheds in the planning area. As an additional example, fish passage projects may have block fish passage for up to a few weeks during removal and upgrade of a structure that seasonally blocks passage, with the goal of improving fish passage for many years to come (National Marine Fisheries Service 2013).

As a last example, for streams listed for temperature under the Clean Water Act, where total maximum daily loads for temperature do not exist yet, short-term project effects in streams listed as 303d for temperature would not be allowed to exceed temperature levels established as beneficial uses for salmonid species, specifically temperature levels that support the life histories and habitat usage by bull trout. Salmon and steelhead where they are present, short-term effects from invasive plant control were defined in the National Marine Fisheries Service regional biological opinion for aquatic restoration (NMFS 2013) as being no more than 10 percent of the acres in an riparian habitat conservation area in any one 6th hydrologic unit code watershed in a given year.

Site potential: A measure of resource availability based on interactions among soils, climate, hydrology, and vegetation. Site potential represents the highest ecological status an area can attain given no political, social, or economic constraints. It defines the capability of an area, its potential, and how it functions. (https://www.fs.fed.us/r6/icbemp)

Site-potential tree: A tree that has attained the average maximum height possible given site conditions where it occurs. FEMAT glossary

Site potential tree height: The average maximum height of the tallest trees (200 years or older) for a given site class.

Spatial: Related to or having the nature of space. (https://www.fs.fed.us/r6/icbemp)

Standards: Mandatory constraints on project and activity decision-making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

Temporal: Related to time. (https://www.fs.fed.us/r6/icbemp)

Temporary road: A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas (36 CFR 212.1).

Unstable and potentially unstable lands: The unstable land component includes lands that are prone to mass failure under natural conditions (unroaded, unharvested), and where human activities such as road construction and timber harvest are likely to increase landslide distribution in time and space to the point where this change is likely to modify natural geomorphic and hydrologic processes (such as the delivery of sediment and wood to channels), which in turn will affect aquatic ecosystems, including streams, seeps, wetlands, and marshes. (https://www.fs.fed.us/r6/icbemp)

Watercourse: A watercourse is any flowing body of water. These include rivers and streams. A natural stream of water fed from permanent or periodical natural sources and usually flowing in a particular direction in a defined channel, having abed and banks or sides, and usually discharging itself Into some other stream or body of water.

Watershed: The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the streamflow at that point.

- The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake. (FEMAT, IX-39)
- Any area of land that drains to a common point. A watershed is smaller than a river basin or subbasin, but it is larger than a drainage or site. The term generally describes areas that result from the first subdivision of a subbasin, often referred to as a "fifth-field watershed." (Ecosystem Analysis at the Watershed Scale v 2.2, p. 25)
- The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the stream flow at that point.

Watershed condition classes: Watersheds are rated as Class 1, 2, or 3.

- **Class 1 Condition:** Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Drainage network is generally stable. Physical, chemical, and biological] conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.
- **Class 2 Condition:** Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.
- **Class 3 Condition:** Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems do not support beneficial uses.

Water development: A water transmission, storage, or diversion facility.

Wetlands: Those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Attachment A. Document Tables

Table 8. Excerpt of aquatic and fish related monitoring from the Blue Mountains forest plans

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	Related Programs/ Indicators	Monitoring Frequency, Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal requirement S: strategic C: consultation	
1. Status of select watershed conditions. Key ecosystem characteristics related to water resources and watershed conditions, such as water quality, quantity, timing and distribution provide the basis for monitoring watershed conditions.							
What is the status and trend of water quality?	Miles of state-listed impaired waters	State 303d-list	5 years	Implementation, effectiveness	Moderate	L, S, C	1.11 Water Quality
What is the status and trend of stream temperature?	Stream temperature	NRIS-AqS temperature data, other agency databases, RMRS stream temperature models	Annual, 10 years	Implementation, effectiveness	Moderate	L, S, C	FOR-6 G-38
What is the status and trend of stream flows?	Streamflow	Federal and state agency databases and Forest Service databases	Annual, 10 years	Implementation, effectiveness	Moderate	S, C	1.1.1 Hydrologic Function
Are watershed/ aquatics standards and guidelines and BMPs being implemented at project sites (e.g., range, roads, recreation, and vegetation management)?	Multiple	Project files, field observations	Annual, 2 years	Implementation	High	L, S, C	1.1 Watershed Function

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	Related Programs/ Indicators	Monitoring Frequency, Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal requirement S: strategic C: consultation	
Are watershed/ aquatics standards and guidelines and BMPs effective at achieving desired on-site conditions at project sites (e.g., range, roads, recreation, and vegetation management)?	Multiple	Field observations	Annual, 2 years	Effectiveness	Moderate	L, S, C	1.1 Watershed Function
What is the status and trend of watershed condition in all watersheds and in key watersheds?	Multiple watershed condition indicators and attributes	Forest Service and other agency databases	5 years	Effectiveness	Moderate	S, C	1.1 Watershed Function
What is the status and trend of riparian vegetation condition?	PIBO effectiveness	PIBO and forest datasets	Annual, 5 years	Effectiveness	Moderate	L,S, C	1.1.2 Riparian Function
What is the change in the distribution of known sites for selected aquatic and riparian invasive species?	Presence of selected invasive species	Federal and state agency databases and Forest Service databases	Annual, 5 years	Implementation, Effectiveness	High	S, C	1.5 Invasive Species
What is the status and trend of aquatic habitat?	Miles of stream habitat improved, PIBO effectiveness	Forest Service databases, PIBO datasets	Annual, 5 years	Effectiveness	Moderate	L,S, C	1.1.6 Aquatic Habitat

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
What is the status and trend of aquatic habitat connectivity?	Miles of stream reconnected	Forest Service databases	Annual, 5 years	Effectiveness	High	L,S, C	1.1.6 Aquatic Habitat
3. Status of select set of the ecological conditions required under §219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern.							
What is the condition, trend and distribution in habitats for aquatic surrogate species (steelhead, spring Chinook salmon, bull trout, and redband trout	See Status and Trend-Aquatic habitat, Status and Trend-Aquatic Habitat Connectivity	Forest Service databases, PIBO datasets	Annual, 5 years	Implementation, Effectiveness	Moderate	L, S, C	1.2 Species Diversity
What is the condition and trend of white bark pine	Acres infected/ uninfected	Forest Service databases,	Annual, 5 years	Implementation, Effectiveness	Moderate	L, S, C	1.13 Special Habitat
4. Status of surrogate species to assess the ecological conditions required under§ 219.9.							
What are the trends in source habitat and risk factors for boreal owl (UMA only), western bluebird, and fox sparrow?	Changes due to management or disturbance events	Accomplishment reports, FACTS, Fire GIS layer, open route density (boreal owl and western bluebird only)	2 years, 5 years	Implementation, effectiveness	Moderate	S	1.2 Species Diversity

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
What are the trends in source habitat and risk factors for Cassin's finch?	Changes due to management or disturbance events	Accomplishment reports, FACTS, Fire GIS layer	2 years, 2 years (5 years for alternatives B, C, and F, UMA only)	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What is the trend of northern goshawk (alternative C only)?	Follow established protocols	None	None	Implementation, effectiveness	Moderate	S	WLD-HAB-9
What are the trends in whitebark pine survival and recruitment?	Whitebark pine survival and recruitment	Whitebark pine transects and plots	5 years, 5 years	NA	Moderate	S	1.13 Special Habitats
6. Measurable changes on other plan area related to climate change and other stressors that may be affecting the plan area.							
Does new scientific information related to climate change indicate a need to change plan components?	New scientific findings	Best available scientific information	5 years	5 years	Low	S	1.2 Species Diversity, 2.11 Community Resiliency
7. Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.							
Are hydrologically connected roads being addressed consistent with plan direction?	Miles treated of hydrologically connected roads	GIS, INFRA, MVUM	Annual, 5 years	Implementation	High	S	WR-3, RMA-RD-10 G-123 RMA-RD-3, Objective Improve hydrologic function

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
Are watershed/aquatic restoration projects (e.g., road decommissioning, passage improvements, riparian stream habitat improvements, etc.) being implemented at a rate consistent with forest plan objectives?	Annual accomplishment metrics (e.g., road miles decommissioned)	Forest Service databases	Annual	Implementation	High	S, C	1.1 Watershed Function

Table 9. Key and priority watersheds for the Malheur National Forest. Acres are total National Forest System acres and may include parts of adjacent national forests.

HUC12	Watershed Name	Category	Acres
170501160101	Upper Big Creek	P	12,632
170501160102	Lake Creek	P	19,944
170501160103	Bosonberg Creek-Malheur River	P	14,749
170501160104	Summit Creek	P	23,261
170501160105	Cliff Creek-Malheur River	KWS	29,342
170501160201	Headwaters Wolf Creek	P	11,428
170501160202	East Fork Wolf Creek	P	12,553
170501160203	Squaw Creek-Wolf Creek	P	11,540
170501160204	Calamity Creek	P	31,400
170501160301	Upper Pine Creek	P	26,562
170501161101	Swamp Creek-North Fork Malheur River	P	25,560
170501161102	Elk Creek-North Fork Malheur River	P	13,523
170501161103	Crane Creek	P	28,734
170501161105	Skagway Creek-North Fork Malheur River	P	11,005
170501161201	Upper Little Malheur River	KWS	31,513
170702010104	Utley Creek	KWS	9,264
170702010205	Upper Deer Creek	KWS	16,061
170702010206	Lower Deer Creek	KWS	12,237
170702010301	Headwaters Murderers Creek	KWS	28,960
170702010303	Upper Murderers Creek	KWS	10,087
170702010305	Lower Murderers Creek	KWS	3,157
170702010501	Headwaters John Day River	P	24,554
170702010502	Deardorff Creek	KWS	10,861
170702010503	Reynolds Creek	KWS	16,382
170702010505	Dads Creek-John Day River	KWS	7,093
170702010601	Strawberry Creek-John Day River	KWS	9,644
170702010605	Indian Creek	KWS	12,236
170702010606	Castle Creek-John Day River	KWS	6,347
170702010701	Upper Canyon Creek	KWS	22,753
170702010702	East Fork Canyon Creek	KWS	15,433
170702010906	Dry Creek-John Day River	KWS	6,344
170702011002	Fields Creek	KWS	10,801
170702030101	Squaw Creek	P	11,145
170702030102	Summit Creek	P	13,246
170702030103	Dry Fork	P	11,242
170702030104	Clear Creek	P	12,145
170702030105	Bridge Creek	P	11,468
170702030106	Mill Creek-Middle Fork John Day River	P	16,661
170702030201	Vinegar Creek-Middle Fork John Day River	P	18,360
170702030202	Little Boulder Creek-Middle Fork John Day River	P	17,431
170702030203	Granite Boulder Creek-Middle Fork John Day River	P	22,594

HUC12	Watershed Name	Category	Acres
170702030204	Big Boulder Creek	P	11,460
170702030205	Upper Camp Creek	P/WCF	18,800
170702030206	Lick Creek	P/WCF	10,470
170702030207	Lower Camp Creek	P/WCF	10,569
170702030208	Balance Creek-Middle Fork John Day River	P	11,172
170702030301	Bear Creek-Middle Fork John Day River	P	18,273
170702030302	Big Creek	P	17,737
171200020103	Upper Scotty Creek	KWS	10,160
171200020201	Upper Bear Creek	KWS	19,161
171200020302	Camp Creek	KWS	24,626
171200020403	Myrtle Creek	KWS	26,910
171200020501	Crowsfoot Creek-Emigrant Creek	KWS	13,680
171200020502	Whiskey Creek-Emigrant Creek	KWS	19,060
171200020503	Bear Canyon Creek	KWS	11,470
171200020504	Little Emigrant Creek-Emigrant Creek	KWS	23,039
171200020505	Cricket Creek	KWS	22,792
171200020506	Sawtooth Creek	KWS	12,453
171200040201	Still Spring Creek-Silver Creek	P	14,922
171200040202	Delintment Creek-Silver Creek	P	17,606
171200040203	Dodson Creek	P	11,679
171200040204	Sawmill Creek	P	14,371
NA	Number of Priority Watersheds/Total Acres:	34	558,796
NA	Number of key Watersheds/Total Acres:	28	441,866

Table 10. Key and priority watersheds for the Umatilla National Forest. Acres are total National Forest System acres and may include parts of adjacent national forests.

HUC12	Watershed Name	Category	Acres
170601030201	North Fork Asotin Creek	KWS	25,012
170601030202	Lick Creek	KWS	8,218
170601030203	South Fork Asotin Creek	KWS	11,910
170601030204	Charley Creek	KWS	9,241
170601030206	Upper George Creek	KWS	8,735
170601041002	Little Lookingglass Creek	KWS	20,648
170601060301	Upper South Fork Wenaha River	KWS	20,250
170601060302	Lower South Fork Wenaha River	KWS	14,760
170601060303	North Fork Wenaha River	KWS	17,586
170601060304	Beaver Creek	KWS	12,485
170601060305	Rock Creek-Wenaha River	KWS	14,389
170601060306	Upper Butte Creek	KWS	16,822
170601060307	Lower Butte Creek	KWS	11,800
170601060308	Cross Canyon-Wenaha River	KWS	19,482
170601060309	Upper Crooked Creek	KWS	18,987
170601060310	First Creek	KWS	13,576

HUC12	Watershed Name	Category	Acres
170601060311	Lower Crooked Creek	KWS	16,585
170601060312	Dry Gulch-Wenaha River	KWS	6,148
170601070601	Headwaters Tucannon River	P	24,508
170601070602	Panjab Creek	P	16,265
170601070603	Little Tucannon River-Tucannon River	P	16,221
170601070604	Cummings Creek	P/WCF	8,696
170701020101	Upper South Fork Walla Walla River	KWS	17,595
170701020102	Middle South Fork Walla Walla River	KWS	14,068
170701020201	Upper Mill Creek	KWS	19,456
170701020301	Upper North Fork Touchet River	KWS	15,587
170701030104	North Fork Umatilla River	KWS	17,476
170701030202	East Meacham Creek	KWS	11,949
170701030203	Butcher Creek-Meacham Creek	KWS	9,892
170701030204	North Fork Meacham Creek	KWS	30,287
170701030205	Camp Creek-Meacham Creek	KWS	15,740
170701030206	Boston Canyon-Meacham Creek	KWS	8,084
170702020204	Clear Creek	P/WCF	19,411
170702020205	Lake Creek	P	11,884
170702020206	Lower Granite Creek	P	19,012
170702020301	Glade Creek-North Fork John Day River	KWS	12,970
170702020302	Meadow Creek	KWS	20,649
170702020303	Big Creek	KWS	17,744
170702020304	Corral Creek-North Fork John Day River	KWS	18,342
170702020401	Headwaters Desolation Creek	P	15,054
170702020402	Upper Desolation Creek	P	21,076
170702020403	Middle Desolation Creek	KWS	13,325
170702020404	Lower Desolation Creek	KWS	6,750
170702020702	West Fork Meadow Brook	KWS	8,529
170702020706	Ellis Creek-Potamus Creek	KWS	14,938
170702020707	Potamus Creek	KWS	13,871
170702020801	Swale Creek	P	13,147
170702020802	Little Wall Creek	P	19,656
170702020803	Skookum Creek-Little Wall Creek	P	20,546
170702020804	Wilson Creek	P	14,886
170702020805	Upper Big Wall Creek	P/WCF	15,631
170702020806	Lower Big Wall Creek	P	11,567
	Number of Priority Watersheds/Total Acres:	15	247,560
	Number of key Watersheds/Total Acres:	37	553,886

Table 11. Key and priority watersheds for the Wallowa-Whitman National Forest. Acres are total National Forest System acres and may include parts of adjacent national forests

HUC12	Watershed Name	Category	Acres
170502010601	Upper Pine Creek	P	18,011
170502010603	Clear Creek	P	14,895
170502010605	East Pine Creek	P	15,921
170502010606	Fish Creek-Pine Creek	P	5,434
170502010608	Lake Fork Creek	KWS	19,969
170502010609	Lower North Pine Creek	KWS	13,890
170502020101	Upper North Fork Burnt River	KWS	16,088
170502020102	Camp Creek	KWS	17,075
170502020103	Patrick Creek-North Fork Burnt River	KWS	8,099
170502020104	Trout Creek	KWS	19,150
170502020105	Petticoat Creek-North Fork Burnt River	KWS	12,718
170502020106	West Fork Burnt River	KWS	8,694
170502020107	Middle Fork Burnt River	KWS	11,406
170502020201	Upper South Fork Burnt River	KWS	20,136
170502020202	Middle South Fork Burnt River	KWS	19,754
170502020301	Higgins Reservoir-Camp Creek	KWS	11,976
170502020302	Higgins Reservoir-Camp Creek	KWS	10,056
170502030101	Cracker Creek	KWS	18,141
170502030105	Deer Creek	KWS	19,267
170502030404	Rock Creek	KWS	12,026
170502030501	Upper North Powder River	KWS	12,061
170502031002	West Eagle Creek	KWS	12,526
170502031004	East Fork Eagle Creek	KWS	26,345
170601020101	North Fork Imnaha River	KWS	13,303
170601020102	South Fork Imnaha River	KWS	17,779
170601020103	Rock Creek-Imnaha River	KWS	11,136
170601020301	Salt Creek-Big Sheep Creek	P	13,626
170601020302	Lick Creek	P	10,235
170601020303	Tyee Creek-Big Sheep Creek	P/WCF	11,865
170601020304	Carrol Creek-Big Sheep Creek	P	8,553
170601020306	Steer Creek-Big Sheep Creek	KWS	14,922
170601020407	Lower Little Sheep Creek-Big Sheep Creek	KWS	4,354
170601040101	Tanner Gulch-Grande Ronde River	P	15,245
170601040102	Limber Jim Creek	P	11,945
170601040103	Meadowbrook Creek-Grande Ronde River	P	12,780
170601040104	Chicken Creek	P	10,965
170601040105	Sheep Creek	P/WCF	18,996
170601040106	Little Fly Creek	P	10,583
170601040107	Upper Fly Creek	P	10,324
170601040108	Lower Fly Creek	P	8,912
170601040109	Warm Springs Creek-Grande Ronde River	P	17,119
170601040201	Upper Meadow Creek	KWS	16,907

HUC12	Watershed Name	Category	Acres
170601040202	Middle Meadow Creek	KWS	21,400
170601040203	Upper McCoy Creek	KWS	12,145
170601040204	Lower McCoy Creek	KWS	5,585
170601040205	Dark Canyon Creek	KWS	9,988
170601040206	Lower Meadow Creek	KWS	18,165
170601040304	Spring Creek	KWS	13,325
170601040306	Rock Creek	KWS	5,823
170601040401	Upper Five Points Creek	KWS	13,159
170601040402	Pelican Creek	KWS	11,637
170601040403	Lower Five Points Creek	KWS	11,806
170601040501	North Fork Catherine Creek	P	21,581
170601040502	South Fork Catherine Creek	P	15,175
170601040503	Milk Creek-Catherine Creek	P	4,777
170601040504	Little Catherine Creek	P	6,902
170601040506	Little Creek	P	3,175
170601040702	Mill Creek	P	5,663
170601050101	West Fork Wallowa River-Wallowa River	KWS	26,925
170601050102	Upper Prairie Creek	KWS	1,745
170601050106	Hurricane Creek	KWS	18,530
170601050108	Spring Creek	KWS	4,743
170601050109	Wallowa Lake-Wallowa River	KWS	4,396
170601050201	Upper Lostine River	KWS	11,207
170601050202	Lake Creek-Lostine River	KWS	17,070
170601050203	Silver Creek-Lostine River	KWS	13,859
170601050204	Lower Lostine River	KWS	1,611
170601050401	Upper Bear Creek	KWS	21,670
170601050402	Lower Bear Creek	KWS	14,789
170601050501	Upper Minam River	KWS	22,571
170601050502	China Cap Creek-Minam River	KWS	21,845
170601050503	North Minam River	KWS	13,983
170601050504	Chaparral Creek-Minam River	KWS	22,479
170601050505	Little Minam River	KWS	29,036
170601050506	Trout Creek-Minam River	KWS	22,806
170601050507	Lower Minam River	KWS	4,239
170601060401	Upper Chesnimnus Creek	KWS	14,807
170601060402	Devils Run Creek	KWS	12,902
170601060403	Middle Chesnimnus Creek	KWS	17,814
170601060407	Peavine Creek	KWS	15,115
170601060502	Elk Creek	KWS	9,719
170601060504	Sumac Creek-Joseph Creek	KWS	9,623
170601060506	Davis Creek	KWS	7,968
170601060507	Lower Swamp Creek	KWS	14,902
170601060508	Cougar Creek-Joseph Creek	KWS	12,983

HUC12	Watershed Name	Category	Acres
17060106wah0601	Peavine Creek-Joseph Creek	KWS	11,242
170601060602	Rush Creek-Joseph Creek	KWS	5,670
170601060604	Broady Creek	KWS	10,270
170702020101	Baldy Creek-North Fork John Day River	KWS	17,096
170702020102	Trail Creek	KWS	12,320
170702020103	Onion Creek-North Fork John Day River	KWS	9,771
170702020201	Upper Granite Creek	P	9,140
170702020202	Bull Run Creek	P/WCF	18,767
170702020203	Beaver Creek	P	12,119
	Number of Priority Watersheds/Total Acres	26	312,708
	Number of key Watersheds/Total Acres	69	946,517

The following tables show the watersheds with analyses and assessment name and year.

Table 12. List of watersheds with watershed analysis, assessment name and year of assessment on the Malheur National Forest (17/17)

NHD HUC10	NHD HUC Name	Assessment Name	Year
1705011601	Headwaters Malheur River	Malheur Headwaters	2000
1705011602	Wolf Creek	Wolf Cr. (L. Malheur)	1996
1705011603	Pine Creek	Pine Creek (L. Malheur)	1996
1705011605	Griffin Creek-Upper Malheur River	Muddy Creek (L. Malheur)	1996
1705011611	Upper North Fork Malheur River	Upper North Fork Malheur	1995
1707020101	Upper South Fork John Day River	Upper South Fork John Day River	1995
1707020102	Middle South Fork John Day River	Deer Creek	2000
1707020103	Murderers Creek	Murderers Creek	1997
1707020106	Grub Creek-John Day River	Prairie City/Strawberry	1997
1707020107	Canyon Creek	Canyon Creek	2004
1707020301	Bridge Creek-Middle Fork John Day River	Upper Middle Fork John Day	1998
1707020302	Camp Creek -Middle Fork John Day River	Galena	2002
1712000203	Upper Silvies River	Upper Silvies	2000
1712000204	Middle Silvies River	Silvies Canyon	2000
1712000205	Emigrant Creek	Emigrant	1997
1712000401	Claw Creek	Wickiup	1998
1712000402	Upper Silver Creek	Silver Creek	1998

Table 13. List of watersheds with watershed analysis, assessment name and year of assessment on the Umatilla National Forest (14/10)

NHD HUC10	NHD HUC Name	Assessment Name	Year
1706010302	George Creek-Asotin Creek	Asotin	1996
1706010408	Willow Creek	Phillips Gordon/Willow	2001
1706010411	Cabin Creek-Grande Ronde River	Phillips Gordon/Willow	2001
1706010601	Grossman Creek-Grande Ronde River	Grande Ronde - Rondawa	2004
1706010705	Pataha Creek	Tucannon	2002
1706010706	Upper Tucannon River	Tucannon	2002
1707010301	Headwaters Umatilla River	Umatilla	2001
1707010302	Meacham Creek	Meacham	2001
1707020201	Headwaters North Fork John Day River	Upper North Fork John Day	1996
1707020204	Desolation Creek	Desolation	1999
1707020205	Upper Camas Creek	Camas Creek	1995
1707020206	Lower Camas Creek	Camas Creek	1995
1707020207	Potamus Creek-North Fork John Day River	Potamus	2006
1707020208	Wall Creek	Wall	1995

Table 14. List of watersheds with watershed analysis, assessment name and year of assessment on the Wallowa-Whitman National Forest (25/19)

NHD HUC10	NHD HUC Name	Assessment Name	Year
1705020106	Pine Creek	Pine Creek	1998
1705020201	North Fork Burnt River	North Fork Burnt River	1995
1705020202	South Fork Burnt River	South Fork Burnt River	1999
1705020203	Camp Creek	South Fork Burnt River	1999
1705020301	Upper Powder River	Upper Powder	1998
1705020305	North Powder River	North Powder - Wolf Cr.	1999
1705020306	Wolf Creek-Powder River	North Powder - Wolf Cr.	1996
1705020310	Eagle Creek	Eagle Creek	1997
1706010201	Upper Imnaha River	Upper and Lower Imnaha	1998
1706010202	Middle Imnaha River	Upper and Lower Imnaha	1998
1706010203	Upper Big Sheep Creek	Big Sheep	1995
1706010204	Lower Big Sheep Creek	Big Sheep	1995
1706010205	Lower Imnaha River	Upper and Lower Imnaha	1998
1706010401	Upper Grande Ronde River	Upper Grande Ronde River	1994
1706010402	Meadow Creek	Meadow Creek	2002
1706010403	Beaver Creek-Grande Ronde River	Beaver Creek	1998
1706010404	Five Points Creek-Grande Ronde River	Spring Cr. - Five Points	1995
1706010405	Upper Catherine Creek	Catherine Creek	1999
1706010502	Lostine River	Lostine	1997
1706010505	Minam River	Minam	1999
1706010604	Chesnimnus Creek	Upper Joseph	1995
1706010605	Upper Joseph Creek	Upper Joseph	1995
1706010606	Lower Joseph Creek	Lower Joseph	2002
1707020202	Granite Creek	Granite Creek	1997
1707020301	Bridge Creek-Middle Fork John Day River	Upper Middle Fork John Day	1998

Attachment B. Use of the Matrix of Pathways and Watershed Indicators and Watershed Condition Framework to Replace Riparian Management Objectives

Riparian Management Areas – Functions and Ecological Processes

Introduction

The PACFISH and INFISH strategies adopted riparian management objectives for stream and streamside conditions to provide criteria against which attainment or progress toward attainment of the riparian goals would be measured. Interim riparian management objectives provided conditions which land managers would strive to achieve as they conducted management activities across the landscape in the absence of ecosystem analysis. It was not expected that the objectives would be met instantaneously, but rather would be achieved over time. The intent of interim riparian management objectives was also not to establish a ceiling for what constitutes good habitat conditions. However, measurable riparian management objectives did provide a benchmark so management actions would not reduce habitat quality and a way to gage inconsistency with the purpose of the interim direction.

The revised land management plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests build upon and refine the concepts and components of the interim aquatic strategies by developing a comprehensive Aquatic Riparian Conservation Strategy that replaces direction within existing land management plans, as amended by PACFISH/INFISH, and the 1995 and 1998 biological opinions for listed fish species. The revised land management plans will use watershed condition indicators within the 1996 National Marine Fisheries Service and 1998 U.S. Fish and Wildlife Service matrix of pathways and indicators in drainages that support listed and proposed fish, their designated and proposed critical habitat, or both. The revised plans will also use either the 12 core indicators within the Forest Service Watershed Condition Framework or the matrix of pathways and indicators within drainages that do not support listed and proposed fish species. The use of these approaches will replace INFISH and PACFISH interim riparian management objectives. This approach is consistent with the 2014 Interior Columbia Basin Strategy that states, “Future conditions/objectives should be based on indicators that are reliably measurable and relevant to the conditions described.”

The watershed condition indicators values within the matrix of pathways and indicators were taken from the original matrices developed by the National Marine Fisheries Service (1996) and the U.S. Fish and Wildlife Service (1998). The analysis that led to development of default values involved managed and unmanaged watersheds in Oregon, Washington, and Idaho that included both inland native fish and anadromous fish. Like riparian management objectives, watershed condition indicators do not to establish a ceiling for what constitutes good watershed and aquatic conditions. However, they do provide quantitative and qualitative diagnostic criteria to assist in evaluating attainment or progress towards attainment of multiple aquatic and riparian desired conditions and compliance with key standards and guidelines. Crosswalks are provided in table 15 through table 21 to clarify how certain matrix and Watershed Condition Framework indicators tie to specific land management plan desired conditions. Measurable watershed condition indicators provide a benchmark by which changes to landscape conditions resulting from management activities and natural processes can be measured over time. It is not expected that aquatic and riparian desired conditions will be met instantaneously, but rather they will be moved toward, or achieved, over time. Attainment of these desired conditions is expected to result in

diverse and complex habitats capable of providing the combination of habitat features important for the life-history requirements of the native fish communities, including federally listed fish, and the dynamic ecological processes that sustain them over time. It will also facilitate compliance with the water quality standards and other requirements of the Clean Water Act.

The use of watershed condition indicators is to provide a diagnostic tool to assist land managers and level 1 teams in assessing how well their management actions are designed to implement the land management plan and move toward related resource goals and desired conditions. Specifically, watershed condition indicators in this attachment will assist in:

1. Identifying how management actions may potentially influence the condition and trend of water, riparian, and aquatic resources, including native and nonnative fish habitat and a variety of other beneficial uses of water designated by the States via the Clean Water Act; and
2. Making Endangered Species Act effects determinations to listed and proposed fish species and their designated and proposed important to assessing Endangered Species Act compliance.

Note: Information explained for footnotes throughout the tables can be found on page 141.

Table 15. Crosswalk between riparian management objectives (RMOs), matrix of pathways and indicators (MPI) watershed condition indicators (WCIs), Watershed Condition Framework (WCF) indicators and Blue Mountains land management plans desired conditions for bull trout local population characteristics within core areas

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Subpopulation Size Bull trout: Mean total subpopulation size or local habitat capacity more than several thousand individuals. All life stages evenly represented in the subpopulation. Steelhead and Chinook: no indicator	Not applicable	FLS-1 Federally listed species (aquatic and terrestrial) are recovered or delisted. Management activities improve the conservation status of listed species and designated critical habitat. Habitats are managed in accordance with conservation planning documents, recovery plans, best available scientific information, and local knowledge. Critical habitat components (i.e., primary constituent elements and primary biological features) are protected and restored to achieve species recovery. For listed aquatic species, on National Forest System lands spawning, rearing, and migratory habitat is widely available and inhabited. Listed aquatic species have access to historic habitat and appropriate life history strategies (resident, fluvial, adfluvial and anadromy) are supported. Recovery is promoted through cooperation and coordination with tribes, state agencies, federal agencies, and other interested groups. For listed terrestrial species, habitat that adequately provides ample resources for all life stages is available and inhabited. Recovery is promoted through cooperation and coordination with Tribes, State agencies, Federal agencies, and other interested groups. For listed plant species, threats such as invasions by aggressive, nonnative plants, adverse livestock grazing management, and changes in fire frequency and seasonality are addressed. Populations achieve recovery through cooperation and coordination with Tribes, State agencies, Federal agencies, and other interested groups.

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Subpopulation Size, continued	Not applicable	AQ-1 Aquatic habitats contribute to ecological conditions capable of supporting self-sustaining populations of native species and diverse plant, invertebrate, and vertebrate aquatic and riparian-dependent species. Aquatic habitats are key for the recovery of threatened and endangered fish species and provide important habitat components for all native aquatic species.
Not applicable	Growth and Survival Bull trout: Subpopulation has the resilience to recover from short-term disturbances (e.g. catastrophic events, etc.) or subpopulation declines within one to two generations (5 to 10 years)[1]. The subpopulation is characterized as increasing or stable. At least 10 plus years of data support this estimate.[2] Steelhead and Chinook: no indicator	Not applicable	SD-1 The natural range of habitats for native and desired nonnative fish, wildlife, and plant species, including threatened and endangered species, species identified as regional forester's sensitive species, and surrogate species, is of adequate quality, distribution, and abundance to contribute to maintaining native and desired nonnative species diversity. This includes the ability of species and individuals to interact, disperse, and find security within habitats in the planning area. These habitat conditions are resilient and sustainable considering the range of possible climate change scenarios. Scale: The desired condition for species diversity can be applied at a variety of scales (i.e., forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections. SD-2 Population strongholds for the fish surrogate species provide high quality habitat and support expansion and recolonization of species to adjacent unoccupied habitats. These areas conserve key demographic processes likely to influence the sustainability of aquatic species.

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Life History Diversity and Isolation Bull trout: The migratory form is present and the subpopulation exists in close proximity to other spawning and rearing groups. Migratory corridors and rearing habitat (lake or larger river) are in good to excellent condition for the species. Neighboring subpopulations are large with high likelihood of producing surplus individuals or straying adults that will mix with other subpopulation groups. [1] Steelhead and Chinook: no indicator	Aquatic Biota 1. Life Form Presence 2. Native Species	SD-1 see above SD-2 see above
Not applicable	Persistence and Genetic Integrity Bull trout: Connectivity is high among multiple (5 or more) subpopulations with at least several thousand fish each. Each of the relevant subpopulations has a low risk of extinction. [1] The probability of hybridization or displacement by competitive species is low to nonexistent. Steelhead and Chinook: no indicator	Aquatic Biota 2. Native Species 3. Exotic species, invasive species, or both	AQ-4 Native fish species have access to historically occupied aquatic habitats and connectivity between habitats allows for the interaction of local populations. Migratory habitats support juvenile and adult mobility and survival between spawning, rearing, overwintering, and foraging habitats that contain areas that are free of obstruction and excessive levels of predators of federally listed aquatic species; have minimal physical, biological, or water quality and quantity impediments (including permanent, partial, intermittent, or seasonal barriers); and contain natural cover such as large wood, aquatic vegetation, rocks and boulders, side channels, and undercut banks. WF-3 Connectivity exists within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide unobstructed routes to areas critical for fulfilling all life history requirements of aquatic, riparian-dependent, and upland species of plants and animals.

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Table 16. Crosswalk between RMOs, MPI WCIs, WFC Indicators and Blue Mountains land management plans desired conditions for water quality

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Water Temperature No measureable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period). Maximum water temperature below 59ºF within adult holding habitat and below 48ºF within spawning and rearing habitats.	Temperature Bull trout: 7 day average maximum temperature in a reach during the following life history stages: [1,3] Incubation 2 - 5° C Rearing 4 - 12° C Spawning 4 - 9° C Also, temperatures do not exceed 15° C in areas used by adults during migration (no thermal barriers). Steelhead and Chinook: 50 to 57° F[16]	Water Quality 1. Impaired Waters (303d Listed)	AQ-1 see above AQ-3 Aquatic habitat elements (e.g., substrate, pools, cover, food, water quality and quantity) are in properly functioning and are sufficiently distributed to ensure egg and embryo survival, fry emergence, and juvenile survival of aquatic species to support self-sustaining populations of native resident and anadromous fish. Spawning and rearing areas contain a minimal amount of fine sediment, ranging in size from silt to coarse sand. WQ-1 Water quality (e.g., temperature, turbidity, and dissolved oxygen) of surface and groundwater is sufficient to support healthy riparian, aquatic, and wetland ecosystems. It is within the range that maintains the biological, physical, and chemical integrity of the system and is capable of benefiting the survival, growth, reproduction, and mobility of individuals composing aquatic and riparian communities. WQ-2 The quality of water within and emanating from the national forests is sufficient to provide for state-designated beneficial uses, including human uses and meets applicable local, state, and tribal water quality criteria. WQ-3 Water quality in streams within the national forests is sufficient to meet applicable state, local, and tribal water quality criteria. RMA-2 The species composition and structural diversity of native plant communities in riparian management areas, including wetlands, provides adequate side channels, pools, undercut banks and unembedded substrates. These conditions result in a variety of depths, gradients, velocities, and structure for seasonal thermal regulation, nutrient filtering, appropriate rates of erosion, and channel migration and supplies amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability.

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Sediment (in areas of spawning and incubation; rearing areas will be addressed under the indicator "Substrate Embeddedness" Bull trout: Similar to chinook salmon[1]: for example: < 12% fines (< 0.85 mm) in gravel; [4] (< 20% surface fines of < 6 mm. [5,6] Steelhead and Chinook: <12% fines (<0.85mm) in gravel, [4], turbidity low	Not applicable	AQ-1 see above AQ-3 see above WQ-1 see above WQ-2 see above WQ-3 see above
Not applicable	Chemical Contamination/Nutrients Bull trout, steelhead, and Chinook: Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no Clean Water Act 303(d) designated reaches. 8	Water Quality 1. Impaired Waters (303d Listed) 2. Water Quality Problems (Not Listed)	AQ-1 see above AQ-3 see above WQ-1 see above WQ-2 see above WQ-3 see above

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Table 17. Crosswalk between RMOs, MPI WCIs, WFC Indicators and Blue Mountains land management plans desired conditions for habitat access

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Physical Barriers Bull trout, steelhead, and Chinook: Man-made barriers present in watershed allow upstream and downstream fish passage at all flows.	Aquatic Habitat 1. Habitat Fragmentation	AQ-1 see above AQ-3 see above

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Table 18. Crosswalk between RMOs, MPI WCIs, WFC Indicators and Blue Mountains land management plans desired conditions for habitat

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Substrate Embeddedness Bull trout: Reach embeddedness <20% [9,10] Steelhead and Chinook: dominant substrate is gravel or cobble (interstitial spaces clear) or embeddedness <20%[4]	Not applicable	AQ-1 see above AQ-3 see above SC-1 The sediment regime under which aquatic ecosystems evolved is maintained, including the timing, volume, rate and character of input, storage, and transport.
Large Woody Debris East of Cascade Crest in Oregon, Washington, Idaho, Nevada, and western Montana >20 pieces per mile; >12" diameter; >35' length	Large Woody Debris Bull trout: Current Eastside values are being maintained at >20 pieces/mile >12 inches diameter >35 feet length; [11,] also adequate sources of woody debris available for both long and short-term recruitment. Steelhead and Chinook: >20 pieces/mile >12 inches diameter > 35 feet length;[7] and adequate sources of woody debris recruitment in riparian areas.	Aquatic Habitat 3. Channel Shape and Function	AQ-3 see above AQ-7 Aquatic habitats in which the distribution of conditions (e.g., bank stability, substrate size, pool depths, size and frequencies, channel morphology, large woody debris size and frequency) in the population of watersheds on the national forest is similar to the distribution of conditions in the population of similar, reference condition watersheds. The distribution of conditions in individual streams vary depending on valley, riparian, and channel characteristics.

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Pool Frequency Channel Width (ft.) No. Pools/Mile 10 96 20 56 25 47 50 26 75 23 100 18 125 14 150 12 200 9	Pool Frequency and Quality: Bull trout: Pool frequency in a reach closely approximates: Wetted width (ft) # pools/mile 0-5 feet 39 5-10 feet 60 10-15 feet 48 15- 20 feet 39 20-30 feet 23 30-35 feet 18 35-40 feet 10 40-65 feet 9 65-100 feet 4 (Can also use formula: pools/mi= 5280/wetted channel width; (pool spacing = #channel widths per pool.). Also, pools have good cover and cool water[4] and only minor reduction of pool volume by fine sediment. Steelhead and Chinook: Channel width (ft) # pools/mile[17] 5 feet 184 10 feet 96 15 feet 70 20 feet 56 25 feet 47 50 feet 26 75 feet 23 100 feet 18 Also meets pool frequency standards and large woody debris recruitment standards for properly functioning habitat	Not applicable	AQ-7 see above

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Large Pools and Pool Quality Bull trout: Each reach has many large pools > than 1 meter deep. Steelhead and Chinook: pools >1 meter deep (holding pools) with good cover and cool water, minor reduction of pool volume by fine sediment.	Not applicable	AQ-7 see above
Not applicable	Off-channel Habitat Bull trout: Watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; side- channels are low energy areas.[4] Steelhead and Chinook: backwaters with cover, and low energy off-channel areas (ponds, oxbows, etc.) [4]	Not applicable	AQ-3 see above
Not applicable	Refugia Bull trout: Habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species.[12,13] Steelhead and Chinook: Habitat refugia exist and are adequately buffered (e.g. by intact riparian reserves); existing refugia are sufficient in size, number and connectivity to maintain viable populations or subpopulations[12]	Not applicable	AQ-3 see above WF-2 see above WF-3 see above

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Table 19. Crosswalk between RMOs, MPI WCIs, WFC Indicators and Blue Mountains land management plans desired conditions for channel conditions and dynamics

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Width-to-Depth Ratio <10, mean wetted width divided by mean depth	Average Wetted Width and Maximum Depth Ratio in scour pools in a stream reach. Bull trout: < or equal to 10[7,5] Steelhead and Chinook: <10 [7,9]	Aquatic Habitat 3. Channel Shape and Function	SC-3 Channel morphology, structure, complexity, and diversity are in ranges that are characteristic of the local geology, climate, and geologic processes.
Bank Stability >80% stable	Streambank Condition Bull trout: >80% of any stream reach has > or equal to 90% stability.[5] Steelhead and Chinook: >90% stable; i.e., on average less than 10% of banks are actively eroding[7]	Not applicable	SC-2 The physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, are properly functioning and in dynamic equilibrium with the flow and sediment regimes under which aquatic systems have evolved.
Not applicable	Floodplain Connectivity Bull trout, steelhead, and Chinook: Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession.	Aquatic Habitat 3. Channel Shape and Function	SC-4 Channel-floodplain connections are intact. Channel bed and bank erosion rates are within natural ranges and do not result in degraded aquatic or riparian habitats or channel alteration.

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Table 20. Crosswalk between RMOs, MPI WCIs, WFC Indicators and Blue Mountains land management plans desired conditions for flow and hydrology

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Change in Peak and Base Flows Bull trout, steelhead, and Chinook: Watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography.	Water Quantity 1. Flow Characteristics	HF-1 Flow regimes, including water yield, timing, frequency, magnitude, and duration of runoff, are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of movement of sediment, nutrients, and wood. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are within the natural range of variability in which the system developed.
Not applicable	Change in Drainage Network Bull trout: Zero or minimum increases in active channel length correlated with human caused disturbance. Steelhead and Chinook: zero or minimum increases in drainage network density due to roads[18,19]	Not applicable	HF-1 see above

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Table 21. Crosswalk between RMOs, MPI WCIs, WFC Indicators and Blue Mountains land management plans desired conditions for watershed conditions

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Road Density and Location Bull trout: <1 miles per square mile, no valley bottom roads[13] Steelhead and Chinook: <2 miles per square mile, no valley bottom roads [20]	Roads and Trails 1. Open Road Density 2. Road Maintenance 3. Proximity to Water	KWS-2 Roads in key watersheds present minimal risk to aquatic resources.

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Disturbance History Bull trout, steelhead, and Chinook: <15% Equivalent Clear-cut Area (ECA) of entire watershed with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area. [14]	Roads and Trails 2. Road Maintenance 3. Proximity to Water 4. Mass Wasting Fire Regime or Wildfire 1. Fire Condition Class or 2. Wildfire Effects Forest Cover 1. Loss of Forest Cover	SS-1 The distribution and abundance of forested structural stages creates conditions that are ecologically resilient sustainable and compatible with natural levels of disturbance processes. Table 12-Table 15 in the land management plans display the range of conditions representing the desired proportion of each upland forest potential vegetation group existing in each of the forested structural stages. The range of desired conditions reflects the natural variations in the mix of structural stage combinations that would be expected to occur across the landscape over time and also allows for flexibility with regards to addressing other desired conditions. DP-1 Fire adapted and fire resilient landscapes are restored and maintained. Wildland fire (planned and unplanned ignitions) plays a characteristic ecological role in creating forest and rangeland conditions that are resilient to disturbances and climate changes. Table 5 in the land management plans displays the natural fire regimes and their associated desired condition ranges for fire severity and frequency by potential vegetation group. Wildland fire may be suitable on all acres, depending on expected fire effects and resource objectives. DP-2 In landscapes that are currently in FRCC 2 or 3, or exhibit a moderate or high vegetation departure score, the FRCC or departure score is decreased to FRCC 1 or a low-level departure score. In landscapes that are currently in FRCC 1 or are exhibiting a low vegetation departure score, these conditions are maintained over time. Wildland fire disturbances and their associated effects occur within natural fire regimes similar to those that occurred prior to the modern fire exclusion (suppression) era. Composition and structure of vegetation and fuels characteristics are similar to the conditions that existed under the historical fire regime.

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Riparian Management Areas Bull trout, steelhead, and Chinook: Riparian management areas provide adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community /composition >50%. [15]	Riparian and Wetland Vegetation 1. Vegetation Condition	WF-1 The watershed-scale processes that control the routing of water, sediment, wood, and organic material operate at levels that support native aquatic species and the proper function of their habitat and do not require human intervention or restoration. RMA-1 Riparian management areas (RMAs) within any given watershed reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area. RMA-4 Riparian vegetation has the species composition, structural diversity, age class diversity, and extent that is characteristic of the setting in which it occurs and the hydrologic and disturbance regimes in which it developed. The condition and composition of small habitat patches may change over small temporal and spatial scales but remains relatively constant at larger scales. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.
Not applicable	Disturbance Regime Bull trout: Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life history forms. [1] Natural processes are stable. Steelhead and Chinook: no indicator	Fire Regime or Wildfire 1. Fire Condition Class or 2. Wildfire Effects Forest Cover 1. Loss of Forest Cover	WF-1 see above WF-2 see above WF-3 see above DP-1 see above

RMOs	MPI Appropriately (bull trout) /Properly Functioning Appropriately WCIs	Watershed Condition Framework Indicator	Blue Mountains Desired Conditions
Not applicable	Integration of Pathways Bull trout: Habitat quality and connectivity among subpopulations is high. The migratory form is present. Disturbance has not altered channel equilibrium. Fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat. The subpopulation has the resilience to recover from short-term disturbance within one to two generations (5 to 10 years.) The subpopulation is fluctuating around equilibrium or is growing. [1] Steelhead and Chinook: no indicator	Not applicable	WF-1 see above WF-2 see above WF-3 see above

Blue Mountains land management plans abbreviations for desired condition labels are: Watershed Function (WF), Riparian Management Area and Riparian Function (RF), Stream Channel (SC), Aquatic Habitat (AQ), Species Diversity (SD), Structural Stage (SS), Federally Listed Species (FLS), Water Quality (WQ), Water Uses (WU), Key Watersheds (KWS), Forest Vegetation (VEG) and Disturbance Processes (DP)

Land Management Plan Direction

Guidance in this appendix is specifically tied to standards WM-1S and RMA-1S within the revised plan. Making this tie to key management direction is consistent with the INFISH, PACFISH, and the 2014 updated Interior Columbia Basin Strategy that states, "Plans should provide direction to assure that projects balance short-term risks and long-term benefits to aquatic and riparian resources in managing toward desired conditions." Standards and guidelines, along with other components of the land management plan, are intended to collectively improve aquatic and riparian functions and processes over the life of the plan. For example, an action that proposes to revise an allotment management plan would need to comply with all applicable forestwide standards and guidelines. To comply with standard WM-1S the action would need to ensure baselines within desired conditions are maintained before the action could proceed. If the baseline were outside desired conditions then the action would need to restore or not retard attainment of desired conditions before it could proceed. To assist in determining consistency with this standard, the land manager would use matrix of pathways and indicators, Watershed Condition Framework indicators, or both in this appendix.

Not every project, even in a degraded baseline, will be restorative. Some management actions will be proposed in a watershed with a "functioning at unacceptable risk" (impaired function according to the Watershed Condition Framework) baseline that will result in short-term "degrade" determination. These management actions are appropriate as long as they do not retard the attainment of aquatic and riparian desired conditions. If riparian and watershed processes are to be restored over time within watersheds that have impaired baselines, it is critical that management actions individually and collectively do not further degrade or retard attainment of desired conditions, as evaluated using watershed condition indicators. It is also critical that management actions in Blue Mountains Aquatic and Riparian Conservation Strategy priority subwatersheds provide some degree of restoration to watershed condition indicators (Watershed Condition Framework indicators) at the appropriate temporal and spatial scales if desired conditions are to be achieved. For example, if after ten years management actions in an priority subwatershed have only maintained impaired conditions, then restoration would not be realized, nor the intent of the long-term Blue Mountains Aquatic and Riparian Conservation Strategy.

Matrix of Pathways and Indicators

Pathways and Watershed Condition Framework Criteria

The eight pathways described in table 22 represent a suite of ecological indicators identified as watershed condition indicators. The ecological indicators values, or watershed condition indicators, found in the matrix of pathways and indicators are diagnostic tools to assist in comparing and evaluating current soil, water, riparian, and aquatic watershed conditions. The habitat indicators correspond to the physical and biological features, formerly known as essential features or primary constituent elements, of designated critical habitat for steelhead and bull trout.

Units of measure specific to each watershed condition indicator are provided, followed by functionality definitions for each watershed condition indicator that are represented as ranges within their respective units of measurement. There are three functional condition levels identified for each indicator: (1) functioning appropriately, (2) functioning at risk, and (3) not properly functioning.

The quantitative and qualitative default watershed condition indicator values provided are not intended to be standards nor absolute values that precisely define desired conditions. Instead, the values and descriptions comprise a diagnostic tool to promote discussions and evaluations of the environmental functional relationships specific to the watershed being considered for management actions. Watershed condition indicators are criteria to assist in evaluating progress towards an attainment of soil, water, riparian, and aquatic goals. They do not replace state and federal water quality standards under the Clean

Water Act or State laws, nor do they make determination of effects to listed fish from proposed management actions considered through the section 7 consultation process.

It is critical that watershed condition indicators be refined, as needed, to better reflect conditions that are functionally attainable in a specific area based on the geoclimatic setting, which includes local geology, land and channel form, climate, potential vegetation, historic and recoverable fish habitat. If default watershed condition indicator values are not functionally attainable given the inherent characteristics of the watershed being considered or if better local data are available to help define a more site- or watershed-specific watershed condition indicator value, follow procedures in the “Indicator Adaptation” section in this appendix to document the basis for the change. If local data relating to a specific watershed condition indicator are not available for comparison and verification, then appropriate default watershed condition indicator values can be used.

The suite of relevant watershed condition indicators, considered together, encompasses the environmental baseline or current condition for the analysis area (for example, subwatershed) and associated aquatic resources. The user must realize not every indicator may be relevant to every area assessed. For example, indicators specific to only bull trout subpopulation characteristics (for example, life history, genetic characteristics, etc.) would not be completed if bull trout were absent (for example, currently or historically) in the assessment area. In these situations, a “not applicable” should be recorded under the desired and existing condition columns.

Note: Information explained for footnotes throughout the tables can be found on page 141.

Table 22. Matrix of pathways and indicators

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
Species Population characteristics: Bull trout only: subpopulation characteristics within subpopulation watersheds (occupied habitat only) Steelhead/Chinook only: MSA population characteristics			
Subpopulation size	Bull trout: Mean total subpopulation size or local habitat capacity more than several thousand individuals. All life stages evenly represented in the subpopulation.[1] Steelhead and Chinook: no indicator	Bull trout: Adults in subpopulation are less than 500 but greater than 50.[1] Steelhead and Chinook: no indicator	Bull trout: Adults in subpopulation has less than 50.[1] Steelhead and Chinook: no indicator
Growth and Survival	Bull trout: Subpopulation has the resilience to recover from short-term disturbances (e.g. catastrophic events, etc.) or subpopulation declines within one to two generations (5 to 10 years)[1]. The subpopulation is characterized as increasing or stable. At least 10 plus years of data support this estimate.[2] Steelhead and Chinook: no indicator	Bull trout: When disturbed, the subpopulation will not recover to pre-disturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend[1]. At lead 10 plus years of data support this characterization. [2] If less data is available and a trend cannot be confirmed a subpopulation will be considered at risk until enough data is available to accurately determine its trend. Steelhead and Chinook: no indicator	Bull trout: The subpopulation is characterized as in rapid decline or is maintaining at alarmingly low numbers. Under current management, the subpopulation condition will not improve within two generations (5 to 10 years.)[1] This is supported by a minimum of 5 plus years of data. Steelhead and Chinook: no indicator
Life History Diversity and Isolation	Bull trout: The migratory form is present and the subpopulation exists in close proximity to other spawning and rearing groups. Migratory corridors and rearing habitat (lake or larger river) are in good to excellent condition for the species. Neighboring subpopulations are large with high likelihood of producing surplus individuals or straying adults that will mix with other subpopulation groups. [1] Steelhead and Chinook: no indicator	Bull trout: The migratory form is present but the subpopulation is not close to other subpopulations or habitat disruption has produced a strong correlation among subpopulations that do exist in proximity to each other. [1] Steelhead and Chinook: no indicator	Bull trout: The migratory form is absent and the subpopulation is isolated to the local stream or a small watershed not likely to support more than 2,000 fish. [1] Steelhead and Chinook: no indicator

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
Persistence and Genetic Integrity	Bull trout: Connectivity is high among multiple (5 or more) subpopulations with at least several thousand fish each. Each of the relevant subpopulations has a low risk of extinction. [1] The probability of hybridization or displacement by competitive species is low to nonexistent. Steelhead and Chinook: no indicator	Bull trout: Connectivity among multiple subpopulations does occur, but habitats are more fragmented. Only one or two of the subpopulations represent most of the fish production. [1] The probability of hybridization or displacement by competitive species is imminent, although few documented cases have occurred. Steelhead and Chinook: no indicator	Bull trout: Little or no connectivity remains for refounding subpopulations in low numbers, in decline, or nearing extinction. Only a single subpopulation or several local populations that are very small or that otherwise are at high risk remain. [1] Competitive species readily displace bull trout. The probability of hybridization is high and documented cases have occurred. Steelhead and Chinook: no indicator
		HABITAT	
Water Quality:			
Temperature	Bull trout: 7 day average maximum temperature in a reach during the following life history stages: [1,3] Incubation 2 - 5° C Rearing 4 - 12° C Spawning 4 - 9° C Also temperatures do not exceed 15° C in areas used by adults during migration (no thermal barriers). Steelhead and Chinook: 50-57° F[16]	Bull trout: 7 day average maximum temperature in a reach during the following life history stages: [1,3] Incubation < 2° C or 6° C Rearing < 4° C or 13 - 15° C Spawning < 4° C or 10° C Also temperatures in areas used by adults during migration sometimes exceed 15 ° C. Steelhead and Chinook: 57-60° F (spawning) 57-64° F (migration & rearing)[7]	Bull trout: 7 day average maximum temperature in a reach during the following life history stages: [1,3] Incubation < 1° C or > 6° C Rearing > 15° C Spawning < 4° C or > 10° C Also temperatures in areas used by adults during migration regularly exceed 15° C (thermal barriers present). Steelhead and Chinook: > 60° F (spawning) > 64° F (migration & rearing) [7]
Sediment (in areas of spawning and incubation; rearing areas will be addressed under the indicator "Substrate Embeddedness"	Bull trout: Similar to chinook salmon[1]: for example:(e.g.,): < 12% fines (< 0.85 mm) in gravel; [4] (< 20% surface fines of < 6 mm. [5,6] Steelhead and Chinook: <12% fines (<0.85mm) in gravel [4], turbidity low	Bull trout: Similar to chinook salmon[1]: e.g. < 12-17% fines (< 0.85 mm) in gravel[4]; (e.g.) 2-20% surface fines. [7] Steelhead and Chinook: <12-20% fines, turbidity moderate [7]	Bull trout: Similar to chinook salmon[1] e.g. >17% fines (< 0.85 mm) in gravel; [4] e.g. >20% fines at surface or depth in spawning habitat.[7] Steelhead and Chinook: >20% fines at surface or depth in spawning habitat, turbidity high
Chemical Contamination/ Nutrients	Bull trout, steelhead, and Chinook: Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no Clean Water Act 303(d) designated reaches. [8]	Bull trout, steelhead, and Chinook: Moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one Clean Water Act 303(d) designated reach. [8]	Bull trout, steelhead, and Chinook: High levels of chemical contamination from agricultural, industrial and other sources, high excess nutrients, more than one Clean Water Act 303(d) designated reaches. [8]

Diagnostic or Pathway	**Functioning Appropriately**	**Functioning at Risk**	**Not Properly Functioning**
Habitat Access:			
Physical Barriers	Bull trout, steelhead, and Chinook: Man-made barriers present in watershed allow upstream and downstream fish passage at all flows.	Bull trout, steelhead, and Chinook: Man-made barriers present in watershed do not allow upstream and/or downstream fish passage at base/low flows.	Bull trout, steelhead, and Chinook: Man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a range of flows.
Habitat Elements:			
Bull trout: Substrate Embeddedness in rearing areas (spawning and incubation areas were addressed under the indicator "Sediment" Steelhead and Chinook: Substrate (fine sediment was addressed under the indicator "Sediment/ Turbidity")	Bull trout: Reach embeddedness <20% [9,10] Steelhead and Chinook: dominant substrate is gravel or cobble (interstitial spaces clear) or embeddedness <20%[4]	Bull trout: Reach embeddedness 20-30% [9,10] Steelhead and Chinook: gravel or cobble is subdominant, or if dominant, embeddedness 20-30%[4]	Bull trout: Reach embeddedness >30% [9,10] Steelhead and Chinook: bedrock, sand, silt or small gravel dominant, or if gravel and cobble dominant, embeddedness >30%[7]
Large Woody Debris	Bull trout: Current Eastside values are being maintained at >20 pieces/mile >12 inches diameter >35 feet length; [11,] also adequate sources of woody debris available for both long and short-term recruitment. Steelhead and Chinook: >20 pieces/mile >12 inches diameter > 35 feet length; [7] and adequate sources of woody debris recruitment in riparian areas	Bull trout: Current Eastside levels are being maintained at minimum levels desired for "functioning appropriately," [11] but potential sources for long term woody debris recruitment is lacking to maintain these minimum values. Steelhead and Chinook: Currently meets standards for properly functioning, but lacks potential sources from riparian areas of woody debris recruitment to maintain that standard.	Bull trout: Current Eastside levels are not at those desired values for "functioning appropriately", [11] and potential sources of woody debris for short and/or long-term recruitment are lacking. Steelhead and Chinook: Does not meet standards for properly functioning and lacks potential large woody debris recruitment.

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
Pool Frequency and Quality	Bull trout: Pool frequency in a reach closely approximates: Wetted width (ft) # pools/mile 0-5 feet 39 5-10 feet 60 10-15 feet 48 15- 20 feet 39 20-30 feet 23 30-35 feet 18 35-40 feet 10 40-65 feet 9 65-100 feet 4 (Can also use formula: pools/mi= 5280/wetted channel width; (i.e., pool spacing= #channel widths per pool.) Also, pools have good cover and cool water[4] and only minor reduction of pool volume by fine sediment. Steelhead and Chinook: Channel width (ft) # pools/mile[17] 5 feet 184 10 feet 96 15 feet 70 20 feet 56 25 feet 47 50 feet 26 75 feet 23 100 feet 18 Also meets pool frequency standards and large woody debris recruitment standards for properly functioning habitat	Bull trout: Pool frequency is similar to values in "functioning appropriately", but pools have inadequate cover/ temperature, [4]and/or there has been a moderate reduction of pool volume by fine sediment. Steelhead and Chinook: meets pool frequency standards but large woody debris recruitment inadequate to maintain pools over time	Bull trout: Pool frequency is considerably lower than values desired for "functioning appropriately"; also cover/temperature is inadequate, [4] and there has been a major reduction of pool volume by fine sediment. Steelhead and Chinook: does not meet pool frequency standards

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
Bull trout: Large Pools (adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow) Steelhead and Chinook: Pool Quality	Bull trout: Each reach has many large pools > than 1 meter deep. Steelhead and Chinook: pools >1 meter deep (holding pools) with good cover and cool water, minor reduction of pool volume by fine sediment.	Bull trout: Reaches have few large pools (>1 meter) present. Steelhead and Chinook: few deeper pools (> 1 meter) present or inadequate cover/temperature, moderate reduction of pool volume by fine sediment	Bull trout: Reaches have no deep pool (>1 meter). Steelhead and Chinook: no deep pools (> 1 meter) and inadequate cover/ temperature, major reduction of pool volume by fine sediment
Off-channel Habitat	Bull trout: Watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; side- channels are low energy areas.[4] Steelhead and Chinook: backwaters with cover, and low energy off-channel areas (ponds, oxbows, etc.) [4]	Bull trout: Watershed has some ponds, oxbows, backwaters, and other off-channel areas with cover; but side- channels are generally high-energy areas.[4] Steelhead and Chinook: some backwaters and high energy side channels[4]	Bull trout: Watershed has few or no ponds, oxbows, backwaters, or other off-channel areas.[4] Steelhead and Chinook: few or no backwaters, no off-channel ponds[4]
Refugia: bull trout: see checklist footnotes for definition of this indicator/ Steelhead/Chinook: Important remnant habitat for sensitive aquatic species	Bull trout: Habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species.[12,13] Steelhead and Chinook: Habitat refugia exist and are adequately buffered (e.g., by intact riparian reserves); existing refugia are sufficient in size, number and connectivity to maintain viable populations or subpopulations[12]	Bull trout: Habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species. [12,13] Steelhead and Chinook: Habitat refugia exist but are not adequately buffered (e.g., by intact riparian reserves); existing refugia are insufficient in size, number and connectivity to maintain viable populations or subpopulations[12]	Bull trout, steelhead, and Chinook: Adequate habitat refugia do not exist.[12]

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
	Channel Condition and Dynamics:		
Bull trout: Average Wetted Width/Maximum Depth Ratio in scour pools in a reach Steelhead and Chinook: Width/Depth ratio	Bull trout: < or equal to 10[7,5] Steelhead and Chinook: <10 [7,9]	Bull trout: 11-20[5] Steelhead and Chinook: 10-12 (NMFS unaware of any criteria to reference)	Bull trout: >20[5] Steelhead and Chinook: >12 (NMFS unaware of any criteria to reference)
Streambank Condition	Bull trout: >80% of any stream reach has > or equal to 90% stability.[5] Steelhead and Chinook: >90% stable; i.e., on average less than 10% of banks are actively eroding[7]	Bull trout: 50-80% of any stream reach has > or equal to 90% stability. [5] Steelhead and Chinook: 80-90% stable[7]	Bull trout: <50% of any stream reach has > or equal to 90% stability. [5] Steelhead and Chinook: <80% stable[7]
Floodplain Connectivity	Bull trout, steelhead, and Chinook: Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession.	Bull trout, steelhead, and Chinook: Reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation and succession.	Bull trout, steelhead, and Chinook: Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent is drastically reduced and riparian vegetation and succession is altered significantly.
	Flow/Hydrology:		
Change in Peak/Base Flows	Bull trout, steelhead, and Chinook: Watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography.	Bull trout, steelhead, and Chinook: Some evidence of altered peak flow, base flow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography.	Bull trout, steelhead, and Chinook: Pronounced changes in peak flow, base flow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography.
Increase in Drainage Network	Bull trout: Zero or minimum increases in active channel length correlated with human caused disturbance. Steelhead and Chinook: zero or minimum increases in drainage network density due to roads[18,19]	Bull trout: Zero or minimum increases in active channel length correlated with human caused disturbance. Steelhead and Chinook: moderate increases in drainage network density due to roads (e.g., ~5%)[18,19]	Bull trout: Greater than moderate increases in active channel length correlated with human caused disturbance. Steelhead and Chinook: significant increases in drainage network density due to roads (e.g., ~20-25%)[18,19]

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
	Watershed Conditions		
Road Density and Location	Bull trout: <1 miles per square mile, no valley bottom roads[13] Steelhead and Chinook: <2 miles per square mile, no valley bottom roads [20]	Bull trout: 1-2.4 miles per square mile, some valley bottom roads[13] Steelhead and Chinook: 2-3 miles per square mile, some valley bottom roads [7]	Bull trout: > 2.4 miles per square mile, many valley bottom roads.[13] Steelhead and Chinook: >3 miles per square mile, many valley bottom roads[7]
Disturbance History	Bull trout, steelhead, and Chinook: <15% Equivalent Clear-cut Area (ECA) of entire watershed with no concentration of disturbance in unstable or potentially unstable areas, and/or refugia, and/or riparian area. [14]	Bull trout, steelhead, and Chinook: <15% ECA of entire watershed but disturbance is concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area. [14]	Bull trout, steelhead, and Chinook: >15% ECA of entire watershed and disturbance is concentrated in unstable or potentially unstable areas, and/or refugia, and/or riparian area. [14]
Riparian Management Areas	Bull trout, steelhead, and Chinook: Riparian management areas provide adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community and composition >50%. [15]	Bull trout, steelhead, and Chinook: Moderate loss of connectivity or function (shade, large woody debris recruitment, etc.) of riparian management areas, or incomplete protection of habitats and refugia for sensitive aquatic species (70-80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community and composition 25-50% or better. [15]	Bull trout, steelhead, and Chinook: Riparian management areas are fragmented, poorly connected, or provide inadequate protection of habitats for sensitive aquatic species (<70% intact, refugia does not occur), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community and composition <25%. [15]
Disturbance Regime (bull trout only)	Bull trout: Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life history forms. [1] Natural processes are stable. Steelhead and Chinook: no indicator	Bull trout: Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate. Steelhead and Chinook: no indicator	Bull trout: Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. [1] Natural processes are unstable. Steelhead and Chinook: no indicator

Diagnostic or Pathway	Functioning Appropriately	Functioning at Risk	Not Properly Functioning
		Species and Habitat:	
Integration of Species and Habitat Conditions (bull trout only)	Bull trout: Habitat quality and connectivity among subpopulations is high. The migratory form is present. Disturbance has not altered channel equilibrium. Fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat. The subpopulation has the resilience to recover from short-term disturbance within one to two generations (5 to 10 years.) The subpopulation is fluctuating around equilibrium or is growing. [1] Steelhead and Chinook: no indicator	Bull trout: Fine sediments, stream temperatures, or the availability of suitable habitats have been altered and will not recover to pre-disturbance conditions within one generation (5 years.) Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. The subpopulation is stable or fluctuating in a downward trend. Connectivity among subpopulations occurs but habitats are more fragmented. [1] Steelhead and Chinook: no indicator	Bull trout: Cumulative disruption of habitat has resulted in a clear declining trend in the subpopulation size. Under current management, habitat conditions will not improve within two generations (5 to 10 years.) Little or no connectivity remains among subpopulations. The subpopulation survival and recruitment responds sharply to normal environmental events. [1] Steelhead and Chinook: no indicator

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Matrix "Environmental Baseline"

The environmental baseline section of the matrix in table 23 is similar to "Step 3: Description of Current Conditions" section for soil, water, riparian and aquatic resources described in version 2.2 of the Federal Guide for Ecosystem Analysis at the Watershed Scale (1995). Completion of this part of the matrix provides the supporting documentation and rationale for the evaluations and determinations of the environmental baseline condition included in a watershed or project-specific National Environmental Policy Act analysis. The matrix was intended to characterize environmental baselines at the watershed scale (5^{th} field hydrologic unit). However, baselines can be assessed at multiple spatial scales (for example, 4^{th} to 7^{th} field hydrologic units) with caution that at very fine scales some indicators (for example, disturbance history) may not be applicable. When evaluating the baseline condition, all land ownerships should be included at the relevant spatial scale for which the matrix is completed.

The current condition of each watershed condition indicator is represented as falling within its respective functionality class as described in table 22, including any refinements to the default values with a footnote listing what process was used to modify them. Thus, this evaluation documents whether an analysis area (for example, subwatershed) is "functioning appropriately", "functioning at risk" or "functioning at unacceptable risk" with respect to the conditions evaluated by a particular watershed condition indicator. The units of measure for watershed condition indicators are generally reported in one of two ways: (1) quantitative metrics that have associated numeric values (for example, "large woody debris: more than 20 pieces per mile"); or (2) qualitative descriptions based on field reviews, professional judgment, etc. (for example, "physical barriers: man-made barriers present"). Different approaches are needed because numeric data are not always readily available for every watershed condition indicator or there are no reliable numeric values. In such cases, a qualitative description of overall functionality may be the only appropriate method to describe the value. When documenting the baseline condition in the matrix, the rationale for that condition must be supported with a narrative description in the project analysis.

Ideally, the baseline condition determination is based on field measurements: habitat inventories, the status and trend of stream habitat and riparian areas from PACFISH-INFISH biological opinion monitoring program data, etc. If data are not available, another form of measurement, professional judgment, or both must be applied. Those projects that have a greater chance of causing adverse effects in areas with no to little baseline information should conduct the appropriate level of field surveys to support the decision. The level of information collected should be commensurate with the scope and scale of project being proposed.

The suite of relevant watershed condition indicators, considered together, encompasses the environmental baseline for the relevant spatial scale and associated aquatic resources. The user must realize not every indicator may be relevant to every area assessed. For example, indicators specific to only bull trout subpopulation characteristics (for example, life history, genetic characteristics, etc.) would not be completed if bull trout were currently or historically absent in the assessment area. In these situations, a "not applicable" should be recorded under the desired and existing condition columns.

Matrix "Effects of the Management Action"

The matrix provides a synthesis of the collective effects of a proposed or ongoing action(s) on watershed and aquatic habitat conditions and processes, as measured by watershed condition indicators. This evaluation will assist the land manager in determining compliance with important

land management plan standards and guidelines, and if water and aquatic resources will be sustained.

The effects of management actions described in table 23 are represented as a change in the functionality of the conditions and processes evaluated by the watershed condition indicator or indicators that would likely result from proposed or ongoing management actions. Effects are identified based on the amount of restoration or degradation for each watershed condition indicator. Table 23 is designed to be used in conjunction with reference conditions (table 22) and environmental baseline conditions. Together they document the effects on watershed and aquatic habitat conditions and processes in terms of being “restored”, “maintained”, “degraded”, or “not applicable”. As with baseline conditions, each action impact in the matrix must be supported with a quantitative description, a narrative description, or both in the project analysis.

The suite of watershed condition indicators must be considered together, both those affected by a proposed action and those not affected, in order to fully describe the condition and trend of the subwatershed and associated aquatic resources and designated beneficial uses that would result from implementation of a proposed management action or continuation of ongoing actions. Table 23 provides supporting documentation for the evaluations and determinations of effects included in biological assessments, project-specific National Environmental Policy Act analyses, or both.

Table 23. Baseline and project effects matrix

Diagnostic or Pathway	Properly Functioning/ Functioning Appropriately	Functioning At Risk	Not Properly Functioning/ Functioning At Unacceptable Risk	Project Effects		
Bull Trout Subpopulation Characteristics within Subpopulation Watersheds:				**Restore**	**Maintain**	**Degrade**
Subpopulation Size						
Growth and Survival						
Life History Diversity & Isolation						
Persistence & Genetic Integrity						
Water Quality:						
Temperature						
Sediment/Turbidity Substrate Embeddedness						
Chem. Contamination Nutrients						
Habitat Access:						
Physical Barriers						
Habitat Elements:						
Large Woody Material						
Pool Frequency						
Pool Quality/Large Pools						
Off-channel Habitat						
Refugia						
Channel Condition and Dynamics:						
Width/Depth Ratio						
Streambank Condition						
Floodplain Connectivity						
Watershed Conditions:						
Road Density/Location Drainage						
Disturbance History Peak Base Flows						
Riparian Habitat Conservation Areas						
Disturbance Regime						
*Integration of Species and Habitat Conditions						

Local Modification of Matrix Indicators

Previous Modifications for Pool Frequency Standard (applied by Umatilla National Forest)

The research conducted for the Interior Columbia Basin Ecosystem Management Project (ICBEMP) was used to determine whether a stream or reach is functioning appropriately or functioning at risk. Summaries from this research were described by Shaun McKinney, et al. (1996) in Aqua-Talk R-6 Fish Habitat Relationship Technical Bulletin Number 11 "A Characterization of Inventoried Streams in the Columbia River Basin." A stream or reach would be considered functioning appropriately if it was equal to or greater than the median value of unmanaged streams in the Blue Mountain Provinces based on McKinney et al. (1996) summary.

The median pools per channel width in unmanaged streams in the Blue Mountains Province were 0.028. This value was compared to the median value for unmanaged streams in the John Day Basin (which has a much smaller sample size and is a subset of the Blue Mountains Province). The median value for the John Day Basin was 0.027. Due to the larger sample size, the value for the entire Blue Mountain Province was used.

Values for pools per mile are listed below along with standards stated in the February 1998 Draft of "A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale" prepared by U.S. Fish and Wildlife Service. Wetted width categories are the same as those presented in the U.S. Fish and Wildlife Service draft paper. The midpoint of the width category was used to calculate the pools per mile using the ICBEMP value. The values listed below are for comparison and the specific standard will be calculated based on the wetted width of each reach.

Table 24. Wetted width and pools per mile from McKinney and others and U.S. Fish and Wildlife Service

Wetted Width (ft.)	ICBEMP (McKinney et al. 1996) pools per mile	USFWS pools per mile
0-5	59*	39
5-10	20	60
10-15	12	48
15-20	8.4	39
20-30	5.9	23
30-35	4.5	18
35-40	3.9	10
40-65	2.8	9
65-100	1.8	4

For streams less than 5 feet wide, reaches would be expected to have a lower density of pools, there is no available way to calculate an appropriate value, so the standard would defer to the value of 39 pools per mile selected by the U.S. Fish and Wildlife Service. To calculate the standard pools per mile using the ICBEMP value of 0.028 for specific channel widths use the following formula (all units in parentheses): 5,280(feet per mile) × 0.028(pools) ÷ channel width (feet) = standard (pools per mile) or 147.8 ÷ channel width = standard pools per mile.

Watershed Condition Framework

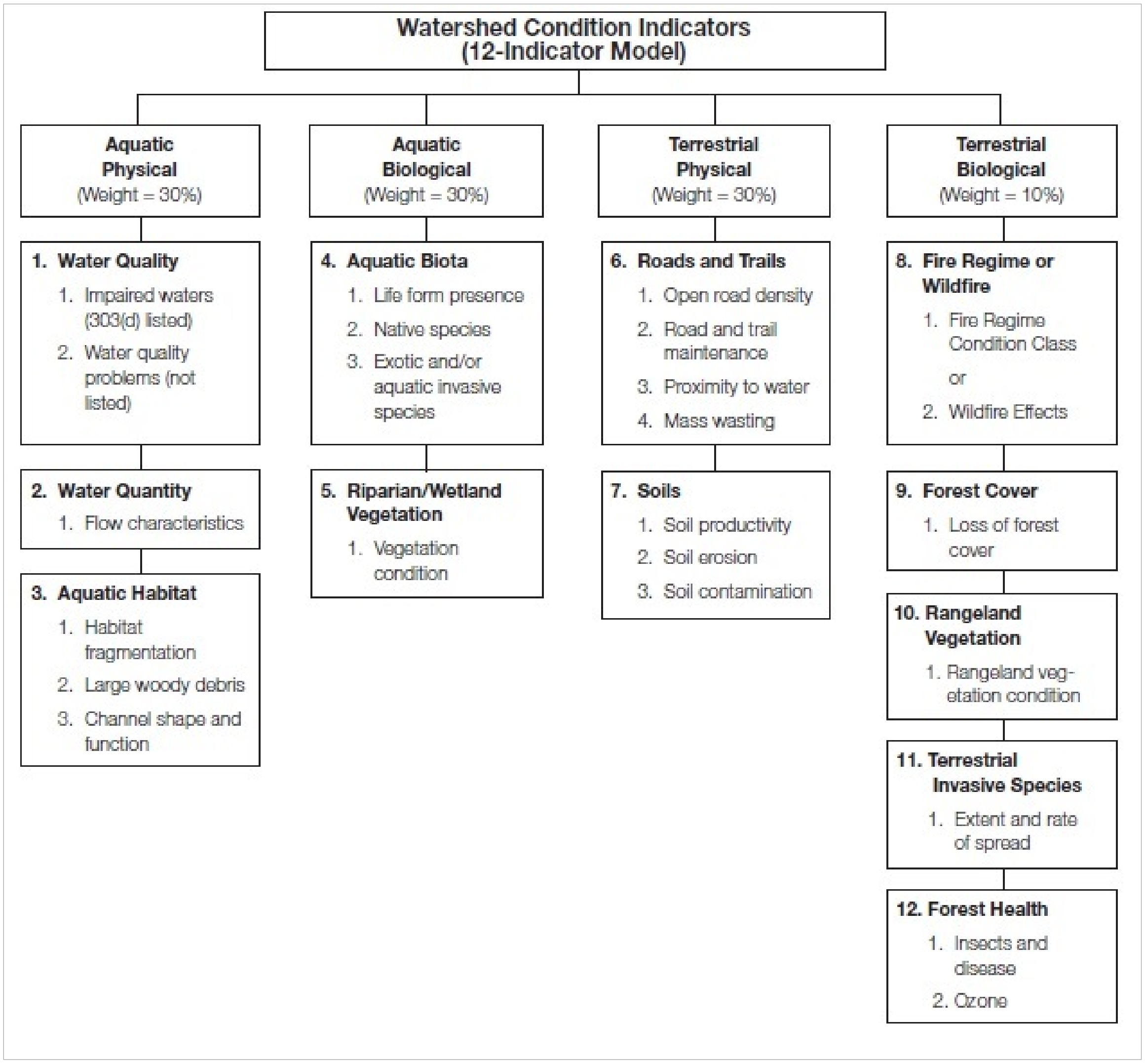

Figure 17. Core national watershed condition framework indicators

As described previously the revised plan will use the Watershed Condition Framework process or the matrix of pathways and indicators within drainages that do not support listed and proposed fish species. The Watershed Condition Framework (USDA Forest Service 2011) is a comprehensive approach for implementing integrated restoration on priority watersheds on national forests and grasslands. Similar to the matrix of pathways and indicators, the Watershed Condition Framework establishes an approach for classifying watershed condition, using a comprehensive set of 12 indicators (figure 17 and table 25 through table 28) that are surrogate variables representing the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed condition. Indicators are grouped according to four major process categories: (1) aquatic physical, (2) aquatic biological, (3) terrestrial physical, and (4) terrestrial biological (figure 17). These categories represent terrestrial, riparian, and aquatic ecosystem processes or mechanisms by which management actions can affect the condition of watersheds and associated resources.

Each of the four process categories is represented by a set of indicators (table 25 through table 28). Each indicator is evaluated using a defined set of attributes. For example, the aquatic physical processes category contains an indicator for aquatic habitat condition. Aquatic habitat condition is evaluated using three attributes: (1) habitat fragmentation, (2) large woody debris, and (3) channel shape and function. Indicators can have as few as one attribute or as many as four attributes. Each indicator attribute receives a condition rating according to criteria in the watershed classification guide[52]. Attributes are categorized into one of three conditions "Functioning Properly" "Functioning at Risk" and "Impaired Function." Ratings are expressions of the "best-fit" descriptor of the attribute for the entire 6th-level watershed being classified.

Actual on-the-ground conditions in any particular subwatershed may be consistent with or differ from these initial classification results. Therefore, when implementing WM-1S, initial Watershed Condition Framework results for a given subwatershed need to be critically evaluated to determine whether they accurately reflect actual conditions and, if not, refined accordingly.

For example, Watershed Condition Framework evaluation criteria consider subwatersheds as functioning properly if they have road densities less than 1 miles per square mile (0.625 kilometers per square kilometer), functioning-at-risk if road densities are more than 1 miles per square mile (0.625 kilometers per square kilometer) but less than less than 2.4 miles per square mile (1.5 kilometers per square kilometer), and impaired function when road densities are more than 2.4 miles per square mile (1.5 kilometers per square kilometer). Recently published data from roads on national forests in Montana (Al-Chokhachy et al. 2016) suggests that these may be reasonable thresholds for coarsely characterizing fine-sediment delivery risks to aquatic habitats associated with surface erosion from road templates. For example, when road densities exceed 1.5 kilometers per square kilometer, sediment delivery is generally higher and median streambed substrate size finer. Nonetheless, actual road conditions in a particular watershed may differ from the initial road-density-based rankings. Recent assessment and monitoring of roads throughout the Pacific Northwest (Black et al. 2017), for example, indicates that a relatively small portion (1.5 to 9 percent) of the road network delivers the majority (90 percent) of the sediment to streams. If the small portion of roads that cause the majority of problems in a particular subwatershed have been identified and addressed, then for the purposes of applying WM-1S, the subwatershed could be considered to be functioning properly for roads, even if the road densities exceed 1.5 kilometers per square kilometer. Conversely, a subwatershed could be considered to be functioning-at-risk or impaired function even if road density is less than 0.625 kilometers per square kilometer, but the majority of those roads are poorly located, built, maintained, or a combination of these things.

Importantly, roads can adversely affect aquatic habitat in many other ways in addition to delivering fine sediments from surface erosion on the road template. Thus, any refinements of initial road rankings should consider the full suite of applicable impacts and risks that roads pose in a particular subwatershed. These could include aquatic habitat fragmentation, effects on runoff efficiency and peak flows, reductions in shade and large wood delivery, stream-floodplain interactions, invasive species, and poaching. The fine sediment and road density discussion above is intended only to provide an example of how these adjustments could be done for a variety of effects using more refined impact measures than simple road density.

Maintenance and restoration of critical watershed and aquatic habitat conditions and processes are expected to result in diverse and complex habitats capable of providing the combination of habitat features important for the life history requirements of the fish community in the watershed and

[52] Watershed Condition Framework

supporting other beneficial uses of water associated with aquatic species and watershed function. The following tables list the 12 national core watershed condition indicators separated into aquatic and terrestrial biological and physical categories.

Table 25. Description of the aquatic physical indicators

Indicator	Description
1. Water Quality	This indicator addresses the expressed alteration of physical, chemical, and biological components of water quality.
2. Water Quantity	This indicator addresses changes to the natural flow regime with respect to the magnitude, duration, or timing of the natural streamflow hydrograph.
3. Aquatic Habitat	This indicator addresses aquatic habitat condition with respect to habitat fragmentation, large woody debris, and channel shape and function.

Table 26. Description of the aquatic biological indicators

Indicator	Description
4. Aquatic Biota	This indicator addresses the distribution, structure, and density of native and introduced aquatic fauna.
5. Riparian/Wetland Vegetation	This indicator addresses the function and condition of riparian vegetation along streams, water bodies, and wetlands.

Table 27. Description of the terrestrial physical indicators

Indicator	Description
6. Roads and Trails	This indicator addresses changes to the hydrologic and sediment regimes because of the density, location, distribution, and maintenance of the road and trail network.
7. Soils	This indicator addresses alteration to natural soil condition, including productivity, erosion, and chemical contamination.

Table 28. Description of the terrestrial biological indicators

Indicator	Description
8. Fire Regime or Wildfire	This indicator addresses the potential for altered hydrologic and sediment regimes because of departures from historical ranges of variability in vegetation, fuel composition, fire frequency, fire severity, and fire pattern.
9. Forest Cover	This indicator addresses the potential for altered hydrologic and sediment regimes because of the loss of forest cover on forest lands.
10. Rangeland Vegetation	This indicator addresses effects on soil and water because of the vegetative health of rangelands.
11. Terrestrial Invasive Species	This indicator addresses potential effects on soil, vegetation, and water resources because of terrestrial invasive species (including vertebrates, invertebrates, and plants).
12. Forest Health	This indicator addresses forest mortality effects on hydrologic and soil function because of major invasive and native forest insect and disease outbreaks and air pollution.

Examples of Project Application of Matrix of Pathways and Indicators and Watershed Condition Framework Indicators

Example 1 - Thinning and prescribed fire vegetation treatments are proposed over a large area including riparian management areas to reduce wildfire risks. Current inchannel large woody debris frequency is “functioning at risk” based on an evaluation of large woody debris matrix of pathways and indicators (in areas with listed species, critical habitat, or both) or Watershed Condition Framework (areas without listed species, critical habitat, or both) indicators over most of the analysis area due to past riparian harvest and stream clearing. The proposed activity should be designed in a way that moves ecosystem processes toward desired conditions, leading toward attainment of functioning appropriately (matrix of pathways and indicators) and functioning properly (Watershed Condition Framework) conditions over the long term, without retarding attainment (for example, measurably slows the natural rate of recovery) of those desired conditions.

Example 2 - The action is to replace a damaged culvert in a 6^{th} field hydrologic unit with federally listed fish with a functioning at risk baseline. Currently, surface fines are between 12 and 20 percent, and embeddedness is between 20 and 30 percent. This action will cause short-term adverse effects to turbidity and embeddedness indicators downstream, but impacts will not go beyond the 6th field hydrologic unit. The action will also restore the fish passage indicator, and will maintain all remaining indicators. This action will be appropriate because it does not retard the attainment of riparian processes and functions, and has measurable long-term ecological benefits by restoring fish passage.

Example 3 - A new placer mine, timber sale, and road restoration project on Forest Service administered lands are planned over several 6^{th} field hydrologic units in the same 5^{th} field watershed. The placer mine occurs in a 6^{th} field hydrologic unit where most indicators are functioning appropriately (matrix of pathways and indicators) or properly (Watershed Condition Framework). The timber sale and road projects occur in hydrologic units where many baseline indicators are functioning at risk (matrix of pathways and indicators) or poor (Watershed Condition Framework). Even though the placer mine will have short- and long-term adverse effects to pool quality and streambank indicators, it is allowed to proceed due to the 1872 Mining Law. However, the national forest personnel works with the permittee to avoid and minimize effects to watershed condition indicators functioning appropriately and to not retard attainment of desired conditions where functioning at risk or not properly functioning, to the extent possible within its authorities. The other two projects are designed to restore watershed condition indicators in the long term, but will cause degradation in the short term to sediment and peak flows at the 6^{th} field scale.

Cumulative effects (as defined in the National Environmental Policy Act) from these actions are expected to occur in a low-gradient reach downstream of each project. If cumulative effects are determined not to degrade or retard indicator functions, the actions can proceed. If cumulative effects degrade indicators at the subwatershed scale, then projects are modified to reduce effects or delayed until baseline conditions improve to be consistent with the land management plan.

Indicator Adaptation (How to Modify the Matrix of Pathways and Indicators and Watershed Condition Framework Indicators)

Background

The original matrix values were based on the state of knowledge as of 1995 and used a data set that is less well documented, but consisted of data from stream surveys conducted during the period 1987-1992 located across the Columbia River basin (Chen et al. 1994). Riparian management objectives developed from these surveys have been described as “broad averages” of streams believed to possess good habitat for anadromous fish.

An outcome of implementing PACFISH (USDA Forest Service and USDI Bureau of Land Management 1995) and INFISH (USDA FS 1995), and subsequent biological opinions (NMFS 1995, 1998; USFWS 1998) was the establishment of a broad scale monitoring network encompassing the interior Columbia River basin and headwaters of the Missouri River basin that includes more than 200 reference (19 in the Blue Mountains) and well over 500 managed sites, including approximately 300 sites in the Blue Mountains (Kershner et al. 2004; Kershner and Roper 2010). Based on PACFISH-INFISH biological opinion monitoring results it has become apparent that some of the metrics currently used as riparian management objectives were not attainable for the majority of reference or managed sites (Henderson et al. 2005; Kershner and Roper 2010).

The PACFISH-INFISH biological opinion monitoring program has provided broad scale information of the status and trend of habitat and riparian conditions (Henderson et al. 2005; Meredith et al. 2013) and more recently has been also used to determine the status and trend of riparian and aquatic habitat conditions for individual forests and hydrologic subbasins (Archer and Meredith 2015a, 2015b, 2015c). The Forest Ecosystem Management Assessment Team (FEMAT) (1993) recognized that “no target or threshold level of (stream) habitat variables can be uniformly applied to all streams” based on the wide range and variability of stream channel characteristics that exists in the Pacific Northwest, and suggested instead that habitat objectives should be developed for individual watersheds.

Existing PACFISH-INFISH biological opinion monitoring data offers the ability to compare habitat attributes for reference conditions from different biophysical settings across broad areas of the Pacific Northwest and to compare streams with similar physical habitat characteristics. The data and methods exist to describe in more detail what streams are capable of in a given environmental setting as well as describe the range of habitat attributes and conditions that may exist within individual watersheds or subbasins (Buffington et al. 2004).

As described in National Marine Fisheries Service (1996) and U.S. Fish and Wildlife Service (1998), there will be circumstances where the numeric values or descriptions in the matrix simply do not apply to a specific watershed or stream, data are unavailable to support an assessment of existing conditions, and/or those data exist in a different format. The PACFISH (USDA FS and USDI BLM 1995) and INFISH (USDA FS 1995) strategies also recognize this issue. Specifically, those strategies note that the interim RMOs, which are comparable to some of the Matrix indices, do not apply in all situations and need to be refined based on local conditions. Kershner and Roper (2010) affirmed this conclusion, as they found even in the least disturbed watersheds, none of 726 reference or managed reaches evaluated met all of interim the riparian management objective values.

Habitat standards have often failed as to protect salmon because they are taken as fixed and do not focus on the dynamic process that create and maintain ecologically complex and resilient watersheds (Reeves et al. 1995; Bisson et al. 1997). Further, because channel and habitat attributes vary, the ranges of values of some attributes for different channel types may overlap making it difficult to define categories of functional, functional at risk, or functional at unacceptable risk. This is why it is critical to focus on the ecological functions and processes that must be maintained and restored rather than fixed values that are intended to be general diagnostic indicators of these processes.

Reference Condition Approach

Ideally, when modifying the matrix of pathways and indicators, functionally attainable indicator values should be based on suitable reference conditions based on the capability of streams in a given biophysical environment. Reference conditions should be as representative as possible of the range of conditions expected in the absence of management (Kershner and Roper 2010). Reference values may be derived from a number of possible sources, including surveys, historical data, inferences from literature, and local landscape conditions.

Due to their importance and variability, there may be particular interest in modifying the stream channel indicators in the matrix. The following provides an example of how those indicators may be modified at the broad-scale or project scale. This approach builds upon the recommendations of Kershner and Roper (2010) and Al-Chokhachy et al. (2010), who recommended selecting habitat objectives based on (1) consistently collected data from the area of interest; (2) metrics that show a demonstrated response to management; and (3) methods that account for landscape characteristics that may influence the value of the objective. The approach uses “reference” or minimally managed watersheds to describe the range of stream habitat and watershed condition attributes that may be expected under natural conditions in a given biophysical environment. These “reference” channel conditions, together with an understanding of key watershed (for example, mass wasting) and channel (for example, sediment transport) processes and disturbance histories, can be used to established meaningful management criteria against which the health or condition of particular stream channels in the watershed of interest can be assessed.

It is intended that habitat indicators not be used strictly as standards as this often has diverted attention away from the dynamic processes responsible for the creation and maintenance of ecologically complex and resilient watersheds (Reeves et al. 1995; Bisson et al. 1997). The use of any set of values as standards could result in reduced variability and diversity of habitat conditions rather than promoting the desired diversity and complexity of habitat conditions across large landscapes (ISAB 2003).

Examples

As shown in table 29, some indicators, indicator values, or both in the matrix may need to be refined, dropped, or replaced. For example, pool frequency is currently evaluated based on habitat type and channel width. Specifically, the matrix indicates that stream channels are ‘functioning properly’ when pool frequency ranges from 18–184 pools per mile in Steelhead and Chinook habitat and from 4–60 pools per mile in bull trout habitat, depending on channel width. As an alternative, evaluators could use data from streams in minimally managed “reference” watersheds to refine these indicator values. The PACFISH-INFISH biological opinion “reference” data for the Columbia Basin, for example, indicates that the expected range of pool frequency values varies by channel type. Specifically, it ranges from about 7–160 pools per mile in plane bed

channels and from 8–295 pools per mile in Rosgen E channels (figure 18). For instance, an evaluator could choose to use the 25th percentile of these distributions as an indicator value for this matrix of pathways and indicators. In that case, plane bed channels would not be rated as functioning properly if pool frequencies in the channels of interest were less than 20 pools per mile in plane bed channels or 70 pools per mile in Rosgen E channels.

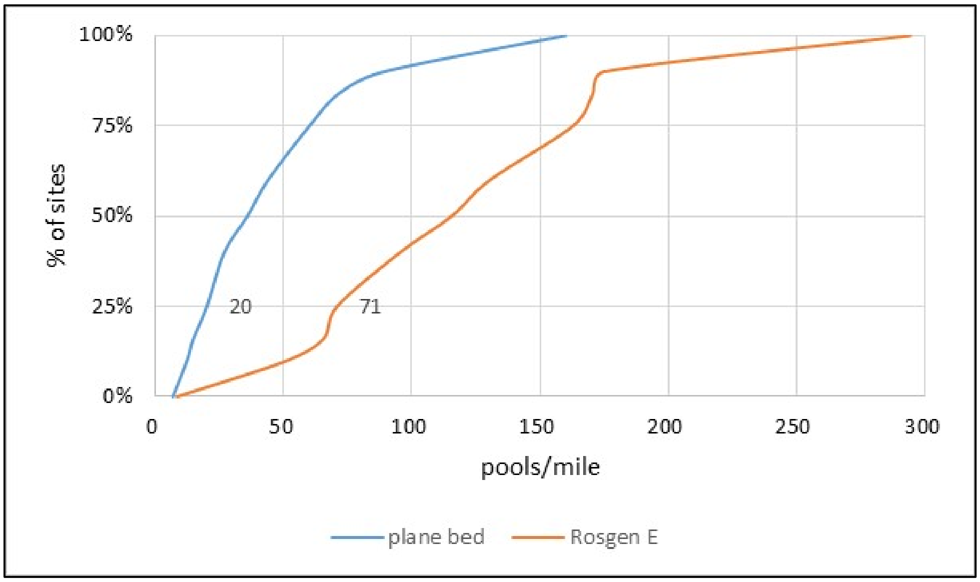

Figure 18. Distribution of pool frequency (pools per mile) values for streams in minimally managed “reference condition” watersheds of the Columbia River Basin: plane-bed channels, Rosgen E channels. Data are from the PACFISH-INFISH Biological Opinion (PIBO) Monitoring Program.

A similar approach could also be used for matrix of pathways and indicators, such as sediment and turbidity, where available metrics are similar to, but somewhat different from, those specified in the matrix. For example, the matrix uses percent fines (less than 0.85 millimeters) in gravel and percent surface fines (less than 6 millimeters) to assess this indicator. In contrast, the PACFISH-INFISH biological opinion collects data on the median particle size (D_{50}, millimeters) and pool tail fines (percent). Similar to pool frequency, PACFISH-INFISH biological opinion data for these metrics at reference sites could be analyzed and used to develop specific criteria by which stream channels in a particular area could be evaluated where relevant data exists. The same is true for the streambank condition matrix of pathways and indicators. In some cases, percent undercut banks and/or bank angle (percent) may be more meaningful indicators than streambank stability.

In addition to using data from reference sites, evaluators could also use empirically derived relationships between channel conditions in reference condition watersheds and various geoclimatic variables. Al-Chokhachy et al. (2010), for example, used data from PACFISH-INFISH biological opinion reference sites and environment variables to develop regression estimates of eight habitat variables (table 29). The regression estimates are converted to scores from zero to 10 for each metric, then combined to an overall index of habitat condition for each PACFISH-INFISH biological opinion site scaled from zero to 100. The habitat index that is currently in use uses only 6 of the original 8 habitat values displayed in table 29. This method could be used to predict reference values for any reach for which the specified input data is available, allowing a comparison of observed and expected values for any reach of interest.

Table 29. Empirical (multiple regression) estimates of stream channel metrics in reference watersheds using selected biophysical variables, Columbia River Basin (Al-Chokhachy et al. 2010).

Biophysical Variables	Estimates of Stream Channel Metrics
Percent undercut banks	0.98 - 0.06(grad) - 0.15(precip) - 0.002(area) + 0.08(ign) - 0.18(sed)
Bank angle	58.1 + 6.7(grad) + 14.8(precip) + 0.29(area) + 0.2(segment slope) - 8.9(ign) + 11.7(sed)
D_{50} (meter)	- 5.5 + 0.63(grad) + 0.65(precip) + 0.02(area) - 0.43(drainage den) - 0.32(ign) + 0.0003(elev)
Percent fine sediment (<6 millimeters)	0.76 - 0.004(area) - 0.11(grad) - 0.19(precip) + 0.12(drainage den) + 0.09(ign)
LWD volume (cubic meters per kilometer)	5.1 + 0.02(% segment forested) - 0.02(segment slope) - 0.001(elev)
LWD frequency (pieces per kilometer)	4.1 + 0.02(% segment forested) - 0.02(segment slope) + 0.48(drainage den)
Residual pool depth (meter)	- 1.1 - 0.24(grad) + 0.004(area) + 0.25(precip)
Percent pools	1.6 - 0.2(grad) - 0.003(area) - 0.0001(elev) - 0.20(precip)

Area=catchment area, square kilometers; precip = average annual precipitation, meters; drainage den = the density of streams within the catchment, kilometers per square kilometer; ign = a categorical variable denoting whether the dominant geology is igneous; grad = reach gradient, percent; elev = elevation of the bottom of the reach, meters; percent segment forested = percentage of the riparian buffer (90 meters on each side of stream) that is forested 1 kilometer upstream from the bottom of reach; sed = a categorical variable denoting whether the dominant geology is sedimentary.

Caveats

While this reference condition approach is a viable method for refining matrix of pathways and indicators, evaluators should recognize that not all channels are expected to attain these values even in the absence of disturbance. Natural biophysical differences (for example, geology, precipitation, vegetation) between watersheds results in substantial variability between stream channels so that no single set of indicator values can be applied equally to all streams (Bisson et al. 1997) and attaining these values would not ensure that the processes responsible for habitat formation are functioning or protected (FEMAT 1993). In addition, as noted in Reeves et al (1995), natural stream and aquatic habitat conditions are a function of disturbance such as fires and floods and will exhibit a range of conditions over time. Therefore, not all aquatic habitats are expected to be in a “good” or “desired” condition at all times. Moreover, by definition, if an evaluator uses the 25th percentile as an indicator value, then even 25 percent of streams in reference condition would not be rated as functioning properly.

Finally, it is critically important that conclusions regarding the status of stream channels be determined based on more than just instream conditions. For example, Lisle et al. (2014) noted channel conditions can result from multiple pathways and processes, as influenced by both natural conditions and human impacts. They therefore concluded that understanding those pathways and processes is critical to assessing whether channels have been or are being affected by current or past management activities and what, if any, management action is needed. In addition, Montgomery and MacDonald (2002), suggested that in-channel metrics should be used only as one component of a diagnostic procedure for assessing and monitoring stream channel conditions. Specifically they proposed that reach-level channel conditions should be assessed as a function of location in the channel network, regional and local biogeomorphic context, controlling influences such as sediment supply and transport capacity, riparian vegetation, the supply of in-channel flow obstructions, and disturbance history.

Indicator Modification

Given the limitations described above, when a matrix of pathways and indicators or Watershed Condition Framework indicator value is not physically or biologically appropriate, given the inherent characteristics (geoclimatic setting) of the area, the value should be modified. Indicator values should be refined to better reflect conditions that are functionally attainable in a specific watershed or stream reach based on local geology, land and channel form, climate, historic and potentially recoverable fish species habitat, and potential vegetation. Modification of default indicator values may be completed through a variety of methods such as watershed and project analysis. It can be done using results of broad-scale and forestwide monitoring and collection and evaluation of watershed-specific data, stream-reach-specific data, or both.

It may be appropriate to evaluate habitat and riparian attributes at scales larger than an individual watershed but it should be recognized that watersheds of any size or scale will contain a finite range of channel, habitat, or riparian attributes and that these attributes may vary between watersheds. Because there are a number of ways to modify the default matrix of pathways and indicators, each with strengths and weaknesses, the specific methods and data to be used need to be defined and agreed upon by the Forest Service, National Marine Fisheries Service, and U.S. Fish and Wildlife Service in watersheds with federally listed fish and their critical habitat. Regardless of what methods are used, written documentation of the methods and procedures, quality and source of data, and rationale supporting the modifications should be included in record documentation. In watersheds with federally listed fish, critical habitat, or both, modification of matrix of pathways and indicators will be coordinated with National Marine Fisheries Service, the U.S. Fish and Wildlife Service through Section 7 consultations, or both.

Riparian Management Areas

As described in the LRMP ARCS, riparian management areas are areas where aquatic and riparian-dependent resources receive primary emphasis and management activities must be designed to benefit those resources. Riparian function and ecological processes descriptions below are intended to:

- Ensure interdisciplinary teams consider and understand the appropriate riparian ecological processes when planning management actions within or affecting riparian management areas designed to maintain or improve these processes.
- Provide additional information to help describe desired conditions. For example, desired condition RMA-1 states: “Riparian management areas within any given watershed reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.” The riparian function and ecological processes can help articulate relevant physical (for example, bank stabilization), chemical (for example, nutrients), and biological conditions to consider.
- Provide additional information to help interpret RMA-1S. RMA-1S is intended to maintain riparian areas when at desired conditions and restore/not retard attainment of desired conditions when riparian management areas are impaired. To fully implement this standard interdisciplinary teams must identify important ecological processes within the analysis area, the status (at desired condition or impaired) of these processes, and evaluate impacts to see how an action maintains, restores, and does not retard attainment of these processes. Descriptions below can help frame the type of processes to consider, the spatial scale they

operate, and the important interactions between terrestrial and aquatic ecosystems that need to be considered when defining desired conditions and describing project effects.

Riparian Functions and Ecological Processes: Considerations

Megahan and Hornbeck (2000) state that a properly designed and managed riparian area can provide a variety of amenities, while protecting riparian functions and ecological processes and diversity of species composition. They further state that a properly designed and managed riparian area includes careful management of forests both within, and outside of the riparian area.

Spence et al. (1996) and Quigley and Arbelbide (1997) identify several important considerations when designing management activities within or affecting riparian management areas. These are as follows:

- A stream requires predictable and near-natural energy and nutrient inputs.
- Many plant and animal communities rely on streamside or wetland forests and vegetation for migratory or dispersion habitat.
- Small streams are generally more affected by hillslope activities than are larger streams.
- As adjacent slopes become steeper, the likelihood of disturbance resulting in discernable instream effects increases.
- Riparian vegetation: 1) provides shade to stream channels; 2) contributes large woody debris; 3) adds small organic matter; 4) stabilizes streambanks; 5) controls sediment inputs from surface erosion; 6) and regulates nutrient and pollutant inputs to streams.

Taking a functional approach to delineating a riparian management area by looking at “zones of influence” (Spence et al. 1996) allows the qualified specialist to focus on specific riparian functions where a relationship between those functions and riparian management area widths are known. The ‘zone of influence’ approach provides the qualified specialist a means to distinguish between those riparian functions and ecological processes potentially affected by the proposed actions and those that, regardless of the riparian management area delineation, the proposed actions will not impair.

In general, the riparian functions and ecological processes that should be considered during project analysis should include (taken primarily from Spence et al. 1996):

- stream shading
- large woody debris recruitment
- fine organic litter
- bank stabilization
- sediment control
- nutrients and other dissolved materials
- riparian microclimate and productivity
- wildlife habitat
- windthrow
- importance of small streams
- importance of hillslope steepness

The following are brief discussions on some of the riparian functions and ecological processes that are intended to assist the practitioner in project analysis.

Stream Shading (excerpted from Spence et al. 1996)

The ability of riparian forests to provide shade to stream channels is a function of numerous site-specific factors including vegetation composition, stand height, stand density, latitude (which determines solar angle), topography, stream width, and orientation of the stream channel. These

factors influence how much incident solar radiation reaches the forest canopy and what fraction passes through to the water surface. The shading influence of an individual tree can be expressed geometrically as a function of tree height, slope, and solar angle. In natural forests, stand density and composition may moderate the shading influence of trees within this zone, with trees closer to the stream channel and understory shrubs providing the majority of stream shade.

Large Woody Debris Recruitment (excerpted from Spence et al. 1996)

Large wood enters stream channels by a variety of mechanisms, including toppling of dead trees, windthrow, debris avalanches, deep-seated mass soil movements, undercutting of streambanks, and redistribution from upstream. In some systems, wood delivered from upslope areas (via land-sliding) or upstream reaches (via floods or debris torrents) may constitute a significant fraction of the total wood present in a stream reach. When evaluating riparian management areas, consideration should be given to potential recruitment of wood from upslope areas and non-fish-bearing channel in addition to wood delivered by toppling, windthrow, and bank undercutting.

The potential for a tree or portions of a tree to enter the stream channel by toppling, windthrow, or undercutting is primarily a function of slope distance from the stream channel in relation to tree height and slope angle. Consequently, the zone of influence for large wood recruitment is defined by the particular stand characteristics rather than an absolute distance from the stream channel or floodplain. Other factors, including slope and prevailing wind direction, may influence the proportion of trees that fall in the direction of the stream channel.

Fine Organic Litter (excerpted from Spence et al. 1996)

Smaller pieces of organic litter (leaves, needles, branches, treetops, and other wood) enter the stream primarily by direct leaf or debris fall, although organic material may also enter the stream channel by overland flow of water, mass soil movements, or shifting of stream channels in unconstrained reaches. Little research has been done relating litter contributions to streams as a function of distance from the stream channel; however, it is assumed that most fine organic litter originates within 30 meters, or 0.5 potential tree heights from the channel.

Bank Stabilization (excerpted from Spence et al. 1996)

Roots of riparian vegetation help to bind soil particles together, making streambanks less susceptible to erosion. In addition, riparian vegetation provides hydraulic roughness elements that dissipate stream energy during high or overbank flows, further reducing bank erosion. In most instances, vegetation immediately adjacent to the stream channel is most important in maintaining bank integrity; however, in wide valleys with shifting stream channels, vegetation throughout the floodplain may be important over longer time periods. Although data quantifying the effective zone of influence relative to root strength is scarce, most of the stabilizing influence of riparian root structure is probably provided by trees within 0.5 potential tree heights of the stream channel. In addition, consideration should be given to the composition of riparian species within the area of influence because of differences in the root morphology of conifers, deciduous trees, and shrubs. Specific relationships between root types and bank stabilization have not been documented; however, if the purpose of riparian protection is to restore natural bank characteristics, then retaining natural species composition is a reasonable target for maintaining bank stabilization function of riparian vegetation.

Sediment Control and Importance of Hillslope Steepness (excerpted from Quigley and Arbelbide 1997)

The ability of riparian management areas to control sediment input from surface erosion depends on several site characteristics including the presence of vegetation or organic litter, slope steepness and slope roughness, soil type, and drainage characteristics. These factors influence the ability of vegetation to trap sediments by determining the infiltration rate of water and the velocity (and hence the erosive energy) of overland flow. The likelihood of disturbance resulting in discernible instream effects increases as adjacent slopes become steeper. Thus, greater preventive measures to avert negative effects to streams, or restore riparian function and ecological processes on steeper slopes may be required to prevent or reduce instream effects.

Prior research on a variety of wildland and agricultural settings has demonstrated that surface erosion increases with increasing slope steepness, although the increase is not linear. The effect of slope has generally been modeled empirically, and has taken the shape of a power function where the exponent is less than 1, so that slope effects are large for gentle slopes and decline, as slopes get steeper. Megahan and Ketcheson (1996) found that sediment travel distances from road cross drains in the Idaho Batholith are proportional to slope gradient (in percent) raised to the 0.5 power.

Megahan and Ketcheson (1996) present equations for estimating sediment travel distance below road fills (non-channelized flow) and cross drains (channelized flow) that incorporate sediment volume, obstructions, slope angle, and source area as significant explanatory variables. The strongest single variable affecting sediment travel distance from soil disturbing activities is the volume of material displaced, or delivered to a point on a slope from a culvert, drain, etc. Over 78 percent of the variance in sediment travel distance is explained by volume in the culvert model (channelized flow) of Megahan and Ketcheson (1996).

They suggest that, except on steep slopes, riparian management areas designed to protect other riparian functions will generally control sediments to the degree that they can be controlled by riparian vegetation. It is essential, however, that riparian protection be complemented with practices for minimizing sediment contributions from outside the riparian area, particularly those from roads and associated drainage structures, where large quantities of sediment are often produced. In addition, activities within the riparian management areas that disturb or compact soils, destroy organic litter, remove large down wood, or otherwise reduce the effectiveness of riparian management areas as sediment filters should be avoided.

Nutrients and Other Dissolved Materials (excerpted from Spence et al. 1996)

Riparian vegetation takes up nutrients and other dissolved materials as they are transported through the riparian zone by surface or near-surface water movement. However, the relationship between riparian management area width and filtering capacity is less well understood than other riparian functions and ecological processes. Those studies that have been published indicate substantial variability in the effectiveness of riparian management areas in controlling nutrient inputs. Identifying an appropriate riparian management area width that can function as a filter for nutrients and other dissolved materials depends on the specific type and intensity of land use, type of vegetation, quantity of organic litter, infiltration rate of soils, slopes, and other site-specific characteristics.

Because of the variability observed in the effectiveness of riparian management areas in controlling input of nutrients and other dissolved materials, it is difficult to recommend specific criteria for this function. Spence (1996) suggests that for most forestlands, riparian management areas designed to protect other riparian functions (for example, large woody debris recruitment,

shading) are probably adequate for controlling nutrient inputs to the degree that such increases can be controlled by riparian management areas. Exceptions may occur when fertilizer or other chemical applications result in high concentrations of nutrients in surface runoff.

Riparian management area widths for nutrient and pollution control on rangelands should be tailored to specific site conditions, including slope, degree of soil compaction, vegetation characteristics, and intensity of land use. In many instances, riparian management area widths designed to protect large woody debris recruitment and shading may be adequate to prevent excessive nutrient or pollution concentrations. However, where land use activity is especially intense, riparian management areas for protecting nutrient and pollutant inputs may need to be wider than those designed to protect other riparian functions and ecological processes, particularly when land-use activities may exacerbate existing water quality problems.

Riparian Microclimate and Productivity (excerpted from Spence et al. 1996)

Changes in micro-climatic conditions within the riparian zone resulting from removal of adjacent vegetation can influence a variety of riparian functions and ecological processes that may affect the long-term integrity of riparian ecosystems. However, the relationship between riparian management area width and riparian microclimate has not been documented in the literature. FEMAT (1993) and Spence (1996) suggest using the generalized curves in FEMAT 1993, relating protection of microclimatic variables relative to distance from stand edges into forests.

Wildlife Habitat (excerpted from Spence et al. 1996)

The importance of riparian areas to many wildlife species is well documented. However, generic recommendations for riparian management areas to protect wildlife are not justifiable because each species has unique habitat requirements. Some terrestrial and aquatic plant and animal communities rely on the forest and shrubs adjacent to streams and wetlands for all or parts of their life cycles. Animals such as beavers, otters, dippers, and some amphibians are obligate stream and riparian vegetation dependent organisms. Other bird and mammal species and many bat species need the riparian management areas at crucial life history periods or seasonally for feeding or breeding. Wildlife has a disproportionally high use of riparian areas and streamside forests compared with the overall landscape. Riparian management areas provide habitat needs such as water; cover; food; plant community structure, composition, and diversity; increased humidity; high edge-to-area ratios; and migration routes. When identifying riparian management areas, it is important to also consider the needs of wildlife species.

Windthrow (excerpted from Spence et al. 1996)

Trees within riparian management areas that are immediately adjacent to clearcuts have a greater tendency to topple during windstorms than trees in undisturbed forests. Extensive blowdown can potentially affect aquatic ecosystems in a number of ways, both positive and negative. In stream systems that lack wood because of past management practices, blowdown may immediately benefit salmonids by providing structure to the channel. Over the long term, however, blowdown of smaller trees may hinder the recruitment of large wood pieces that are key to maintaining channel stability and that provide habitats for vegetation and wildlife within the riparian zone. In addition, soil exposed at the root wads of fallen trees may be transported to the stream channel, increasing sedimentation. Other riparian functions, including shading, bank stabilization, and maintenance of riparian microclimates may also be affected.

Importance of Small Streams

Small streams are more affected by hillslope activities than are larger streams because there are more smaller than larger streams within watersheds (actual area and extent); smaller channels respond more quickly to changes in hydrologic and sediment regimes; and streamside vegetation is a more dominant factor in terms of woody debris inputs and leaf litter and shading. Small perennial and intermittent non-fish-bearing streams are especially important in routing water, sediment, and nutrients to downstream fish habitats.

Channelized flow from intermittent and small streams into fish-bearing streams is a primary source of sediment in mountainous regions. In steep, highly dissected areas, intermittent streams can move large amounts of sediment hundreds of meters, through riparian management areas, and into fish-bearing streams. In-channel sediment flows are limited primarily by the amount and frequency of flow and by the storage capacity of the channel. Flows in forested, intermittent streams are generally insufficient to move the average-sized wood piece, allowing large wood to accumulate in small channels. These accumulations increase the channel storage capacity and reduce the likelihood of normal flows moving sediment downstream.

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Appendix B: Possible Management Actions

Possible management actions are those actions that the national forest staff anticipates to occur over the life of the Plan and that show the variety of multiple use opportunities or resource management programs that the staff expects to provide (36 CFR 219.11(b) and (c)). The possible management actions are presented as a brief summary of the types of projects that may occur to maintain or move the national forest toward desired conditions. Because the Plan is a strategic document that provides general management guidance, the following items include program strategies anticipated during the next 15 years.

The list of possible management actions is not intended to be all-inclusive, nor are the identified possible management actions intended to be decisions. They are projections of what actions may take place in the future for program areas that might constitute the typical annual program of work for a national forest.

Goal 1 – Promote Ecological Integrity

Aquatic and Riparian Ecosystems

Management activities include both passive and active restoration to maintain and improve habitat and ecological conditions capable of supporting ground and surface hydrologic function and self-sustaining populations of native riparian-dependent plant and animal species. Passive restoration is the broad-scale, natural recovery of aquatic ecosystems and includes implementation of best management practices, key watersheds and designation of riparian management areas. Active restoration includes targeted management activities with the goal of restoring specific processes that improve aquatic and riparian habitat function. Activities for active restoration may include:

- Adding large woody debris to selected stream reaches to improve degraded conditions and stream channel stability.
- Planting riparian vegetation for bank stability and shade.
- Treating invasive terrestrial plant species in riparian areas to improve riparian community structure.
- Removing, reconstructing, or improving roads located in riparian areas to improve watershed health and reduce sediment delivery to the aquatic ecosystem.
- Treating upland roads to reduce water interception.
- Replacing or removing culverts to improve passage for native species, where appropriate, and to improve hydrologic function and sediment transport.
- Installing riparian area fencing.

Vegetation

Vegetation management includes those activities that actively move vegetation towards desired conditions. Vegetation management might include activities that would maintain or increase representation of early seral, shade-intolerant, drought- and fire-tolerant, or insect- and disease-resistant species and dominance types. Activities also could treat areas to maintain or improve

forest resilience, natural diversity, and productivity, and to reduce negative impacts resulting from nonnative organisms. Specifically, the following types of actions may occur:

- Thinning forested stands to maintain or improve forest health and to produce a positive trend towards historic densities, composition, and structure.
- Regeneration of vegetation to mimic historic community composition and structure using a variety of silvicultural prescriptions.
- Planting blister rust resistant western white pine or whitebark pine.
- Pruning western white pine to reduce vulnerability to white pine blister rust.
- Pruning trees to reduce dwarf mistletoe infections.
- Girdling overstory trees infected with dwarf mistletoe to prevent spread to understory host trees.
- Maintaining or restoring rare plant habitat and special and unique ecological communities.
- Planting shade-intolerant, fire-adapted, drought resistant species.
- Managing stands to retain or move towards old forest characteristics.
- Treating invasive terrestrial plant species.
- Treating insects and diseases using integrated pest management techniques.

Wildlife

Successfully managing for habitats that will maintain viable populations of all native and desirable nonnative wildlife species requires a combination of minimizing threats while providing a similar amount, quality, and distribution of habitat to what occurred historically. Some threats are not easily minimized (such as climate change), while other threats such as human disturbance and invasive species are more easily mitigated. Providing habitat that is within the historical range of variability will largely be achieved by meeting the desired condition for other resources such as forest vegetation, rangeland, soil, and water quality. Activities might include:

- Prescribed burning within forest understories to maintain or restore wildlife habitat.
- Harvest of shade-tolerant trees to restore historical habitat conditions and associated surrogate species.
- Restoring wetland and riparian habitat to restore populations of amphibians.
- Increasing security habitat to improve distribution of elk and encourage elk to remain on public lands.
- Restore habitat effectiveness by considering designating routes for other uses, or closing or decommissioning roads where open motor vehicle routes are negatively affecting wildlife.
- Treating invasive plant species to improve forage for wildlife.
- Planting vegetation for riparian dependent wildlife species.
- Removing unnecessary rangeland fencing to reduce mortality to wildlife.

Fire Management

Planned and unplanned fire is managed to address excess fuels and restore the ecosystem processes essential in maintaining resilient landscapes. Fires are managed using current science, modern decision tools, and collaborative decisionmaking. Prescribed fires are considered the most effective fuels management tool for restoring and maintaining fire-adapted systems; therefore, planned (prescribed) fire may be used in all management areas covered in this Plan. Safety of fire personnel and the public is the highest priority. Actions related to treatment of fuels may include the following:

- Planned ignitions in any management area, as well as areas in the wildland-urban interface.
- Mechanical treatments, including commercial timber sales and noncommercial treatments, to reduce fuels.
- Unplanned ignitions will be allowed to burn when they contribute to achieving restoration goals.

Invasive Species

Management actions for invasive species and other undesirable species (terrestrial and aquatic plants and animals) strive to maintain areas free of invasive species or reduce their distribution to small areas, thereby limiting or eliminating their impacts on the viability of native and desired nonnative species. Actions related to invasive species treatments may include:

- Using an array of tools (chemical, biological, manual, mechanical, and cultural) to suppress, contain, control or eradicate invasive species.
- Providing education and outreach programs designed to increase awareness of invasive species.
- Implementing preventative measures (such as pre- and post-work equipment sanitation, requiring certified weed-free seed and hay, or sequencing of activities) through annual operating instructions, permitting, contracting, and other national forest administrative processes.
- Collaborating with other agencies and entities to replace nonnative aquatic species with natives.
- Cooperating with Oregon and Washington State agencies, local governments and other organizations to support a successful invasive species management program.

Goal 2 – Promote Social Well-Being

Scenery

Management actions to support and enhance scenic resources may be accomplished through maintenance, restoration, or enhancement of the natural landscape through use of the vegetation, wildlife and the aquatic and riparian tools and techniques described above.

Recreation

Management actions to support developed, dispersed, and backcountry recreation provide for a variety of recreational opportunities on the national forest. Possible recreation management actions may include the following:

- Implementing trail construction, reconstruction, maintenance, and relocation projects.
- Using volunteers and partners for trail maintenance.
- Implementing construction and reconstruction of facilities such as parking areas, toilets, trailheads, information kiosks, fishing access, and boating access points.
- Maintaining and upgrading facilities such as campgrounds, picnic areas, toilets, and parking lots.
- Maintaining and modifying dispersed recreation sites to reduce or eliminate impacts to natural and cultural resources.
- Providing special use permits for commercial recreation opportunities (such as resorts, ski areas, outfitters and guides, and special events).
- Providing recreational rental cabin and lookouts for public use.

Access and Road Management

Access and road management actions serve to maintain and improve the national forest transportation system to enhance recreation opportunity, provide administrative access for resource management, and reduce negative impacts on ecosystems and natural and cultural resources. Actions may include:

- Conducting travel management planning. Identifying summer routes that are open to wheeled motorized vehicles, and identifying areas and trails for motorized and nonmotorized winter uses on the national forest.
- Supporting access via permanent road construction and temporary road reconstruction actions.
- Implementing measures (such as education, signage, law enforcement, or seasonal road closures) to discourage encroachment of motorized vehicles into nonmotorized areas.
- Conducting annual road maintenance on existing roads, and implementing emergency repairs necessitated by natural events.

Heritage Resources

Heritage resource management actions ensure that significant archaeological and historical resources are identified, protected, and preserved for the benefit and enjoyment of the public and future generations Heritage resources activities may consist of:

- Conducting surveys to identify significant sites, and follow-up actions necessary to protect, stabilize, or salvage sites.
- Identifying and evaluating heritage resources for the National Register of Historic Places.
- Stabilizing, rehabilitating, restoring, and stewarding heritage resources.
- Conducting deferred maintenance to historic facilities.
- Promoting heritage values through public education, outreach, and interpretative programs.
- Conducting scientific and historic research on heritage.

American Indian Rights and Interests

The Forest Service has certain legal responsibilities to American Indian tribes that are clarified in statutes, executive orders, and enacted case law that is interpreted for the protection and benefit of federally recognized American Indian tribes. Activities associated with American Indian tribes may consist of:

- Continued habitat management of traditional use areas and development of management plans for ongoing consultation through a cooperatively established communication policy.
- Cooperatively established policy for continued access and acquisition of forest products for each federally recognized tribe with historical or treaty interest for cultural uses.
- Ongoing government-to-government and staff consultation for each federally recognized tribe with historical or treaty interests in national forest lands, through a cooperatively established communication policy.

Goal 3 Promote Economic Well-being

The public expects a diversity of uses from national forest lands. Social well-being contributes to resilience in national forests by fostering public use patterns and restoration strategies that help support human communities, livelihoods, cultures, and social values. Management actions within the national forest contributes to outputs and opportunities that support community infrastructure and may include:

- Contributing to and supporting local jobs and labor income within the counties surrounding the national forest through anticipated outputs associated with management activities such as forest products and grazing.
- Coordinating management plans and activities with State, local and Tribal governments.

Lands and Special Uses

The national forest lands program emphasizes land acquisitions that protect and enhance identified management resource needs. The program also pursues opportunities to consolidate land ownership, decrease management conflicts, increase management efficiencies, secure and mark property boundaries, and secure rights-of-way to meet administrative and public needs. Special use permits provide a wide range of recreation and non-recreation special use permits that authorize the occupancy and use of National Forest System lands. Lands and special use program actions may include:

- Maintaining landlines and actions associated with adjusting national forest ownership through purchases, exchanges, or other conveyances.
- Permitting uses (such as easements), structures (such as communication towers), outfitters and guides, and special events.
- Issuing right-of-way authorizations.
- Implementing strategic land acquisitions.

Forest Products

The supply of timber outputs contributes to a local forest products industry. Forest product actions may include:

- Using various harvest methods for timber production and tree cutting to achieve vegetation desired conditions and contribute to the local and regional economy.
- Salvaging dead or dying timber.
- Gathering of firewood, huckleberries, and other special forest products.

Grazing

The annual amount of grazing that occurs within the national forest varies due to resource conditions and livestock markets. National forest staff adjusts the amount and timing of use based on forage utilization standards. Activities may consist of:

- Permitting livestock grazing where compatible with management area suitability.
- Completing environmental analysis and assessing and updating allotment management plans to improve allotment management and protect and manage the resources present within them.
- Building fences, constructing and maintaining water developments, managing invasive plants, implementing deferred or rest-rotation grazing systems, and improving livestock distribution.
- Working with permittees, States, Tribes, and other organizations to maintain or improve rangeland conditions.

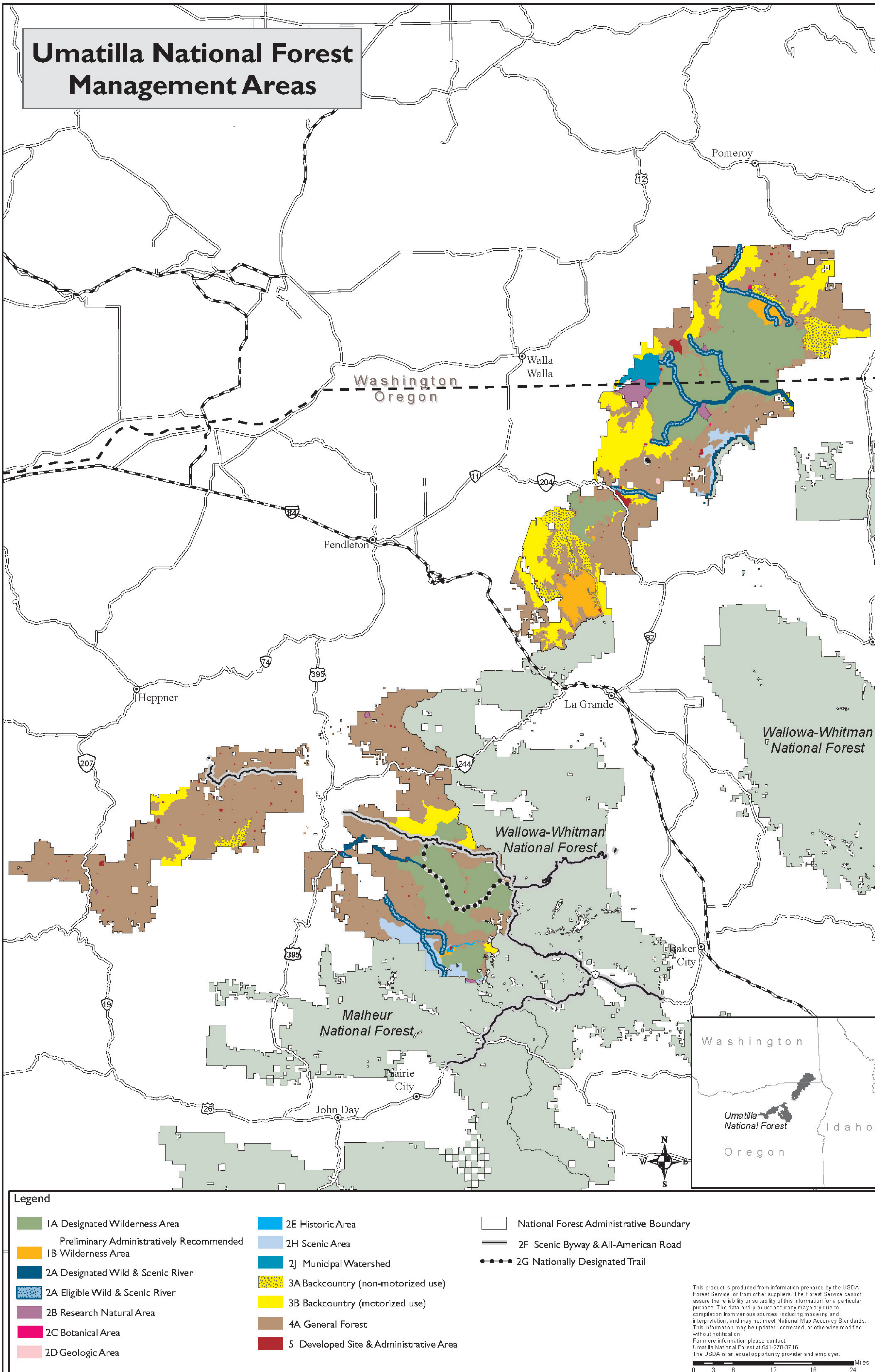
Minerals

Minerals on the national forest include leasable energy minerals, saleable minerals, and locatable minerals. Mineral administration activities may consist of:

- Facilitating the orderly exploration, development, and production of mineral and energy resources within the National Forest System on lands open to these activities or on withdrawn lands consistent with valid existing rights.
- Processing mineral applications, operating plans, leases, licenses, permits, and other use authorizations efficiently and in a timely manner. Interacting with applicants and operators according to the principles of customer service.
- Planning for, providing, and maintaining access to and occupancy of National Forest System lands for mineral resource activities. Eliminating or preventing occupancy that is not reasonably incident to and required for the mineral operation.
- Restoring ecosystems and watersheds affected by past mining practices.
- Providing geologic expertise and scientific information necessary for sustained forest management and for watershed health and restoration.
- Managing and protecting paleontological resources.
- Administering through special use application and report, for free-use disposals.
- Establishing community pit areas to provide sources of mineral materials for small volume and noncommercial users.
- Disposing of mineral materials from community sites and common-use areas by negotiated sale or free-use permit.

Appendix C: Maps

- Management Areas (this map is an 11-inch by 17-inch format)
- Suitability for Timber Production
- General Suitability for Cattle Grazing
- General Suitability for Sheep Grazing
- Key and Priority Watersheds
- Elk Priority Areas


Umatilla National Forest
Management Areas
Pomeroy
12
Walla
Walla
Washington
Oregon
11
204
84
Pendleton
82
74
395
Heppner
La Grande
Wallowa-Whitman
National Forest
207
244
Wallowa-Whitman
National Forest
Baker
City
395
7
19
Malheur
National Forest
Prairie
City
26
John Day
Washington
Umatilla
National Forest
Idaho
Oregon
N
W
E
S
Legend
1A Designated Wilderness Area
Preliminary Administratively Recommended
1B Wilderness Area
2A Designated Wild & Scenic River
2A Eligible Wild & Scenic River
2B Research Natural Area
2C Botanical Area
2D Geologic Area
2E Historic Area
2H Scenic Area
2J Municipal Watershed
3A Backcountry (non-motorized use)
3B Backcountry (motorized use)
4A General Forest
5 Developed Site & Administrative Area
National Forest Administrative Boundary
2F Scenic Byway & All-American Road
2G Nationally Designated Trail
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Umatilla National Forest at 541-278-3716
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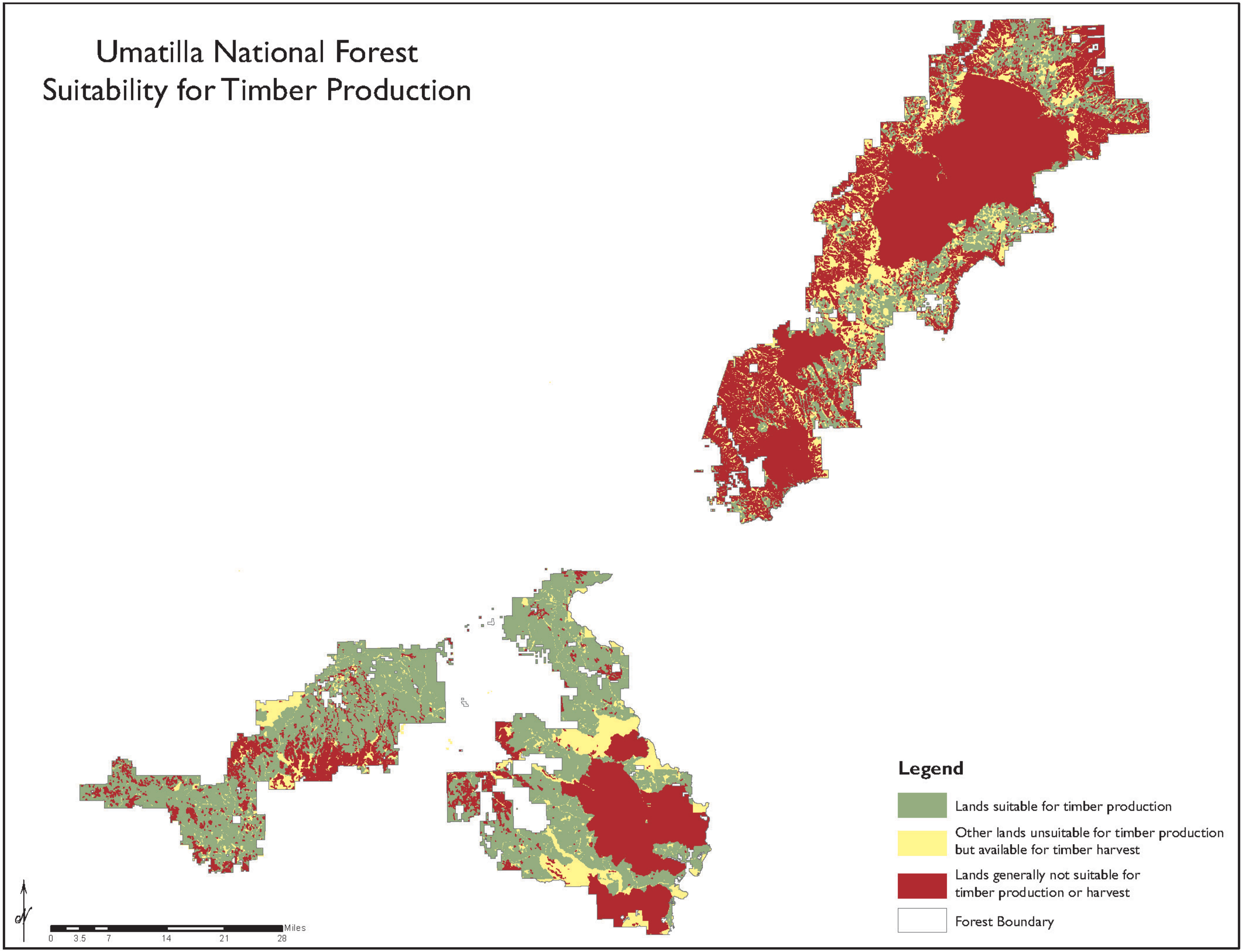
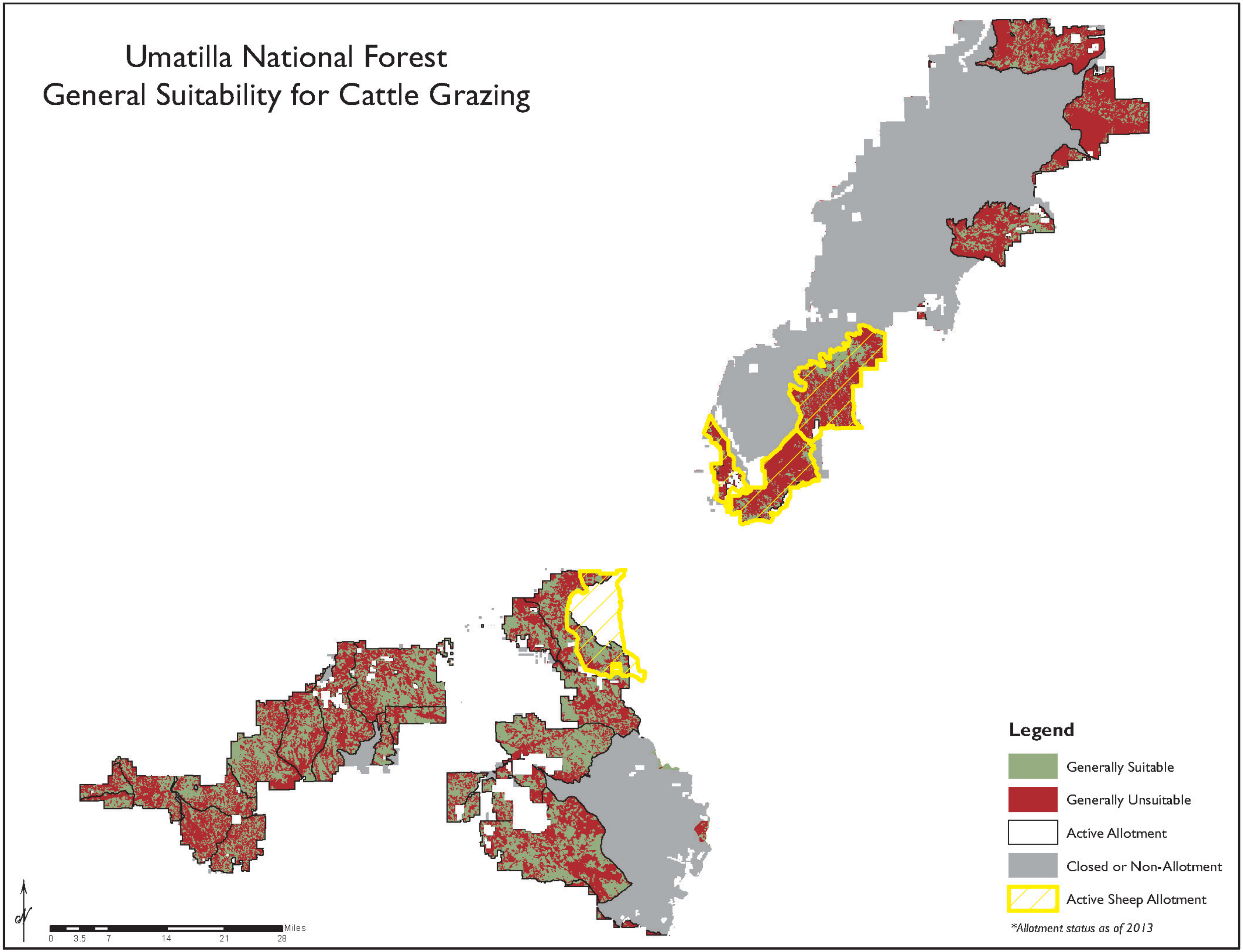
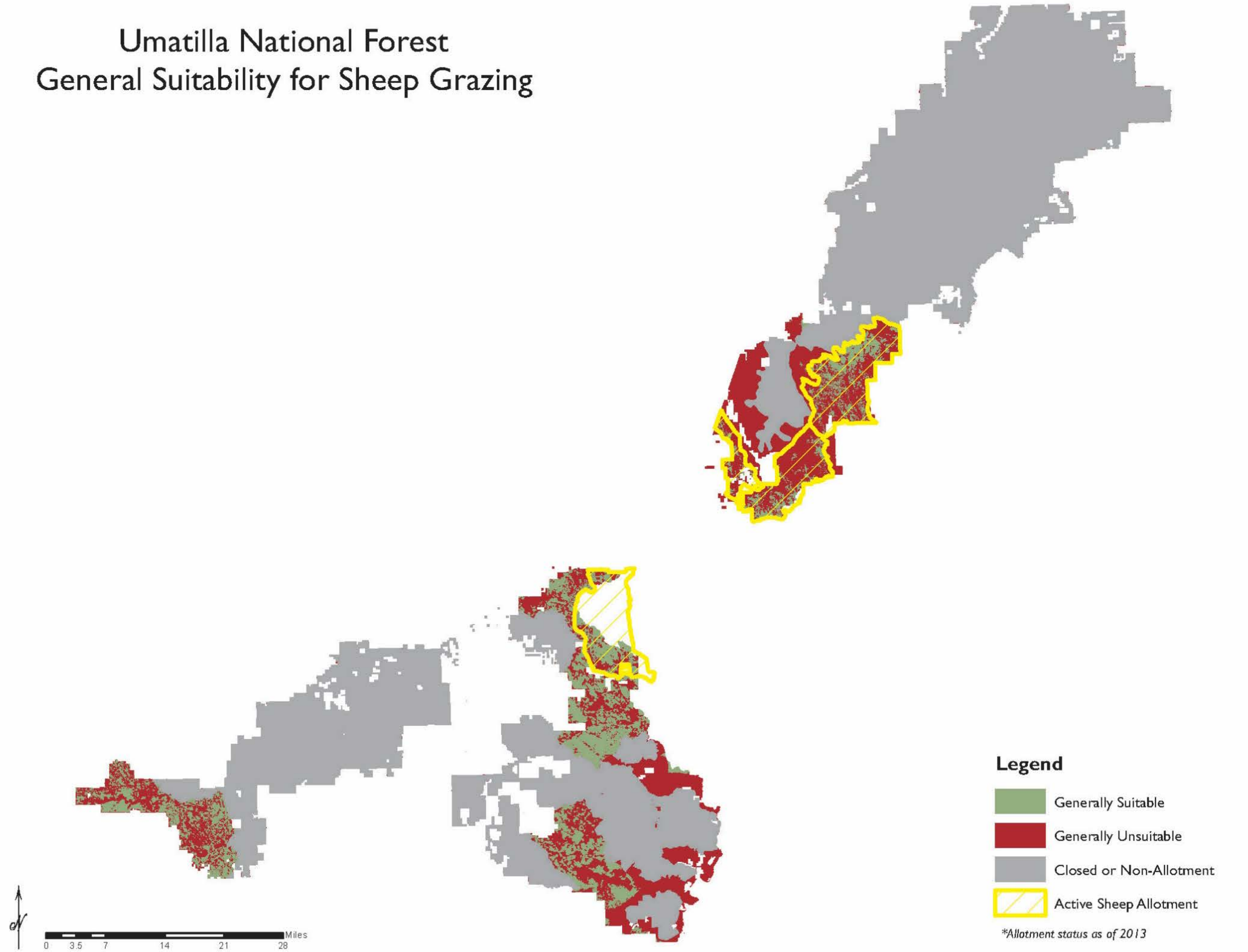
Miles
0
3
6
12
18
24

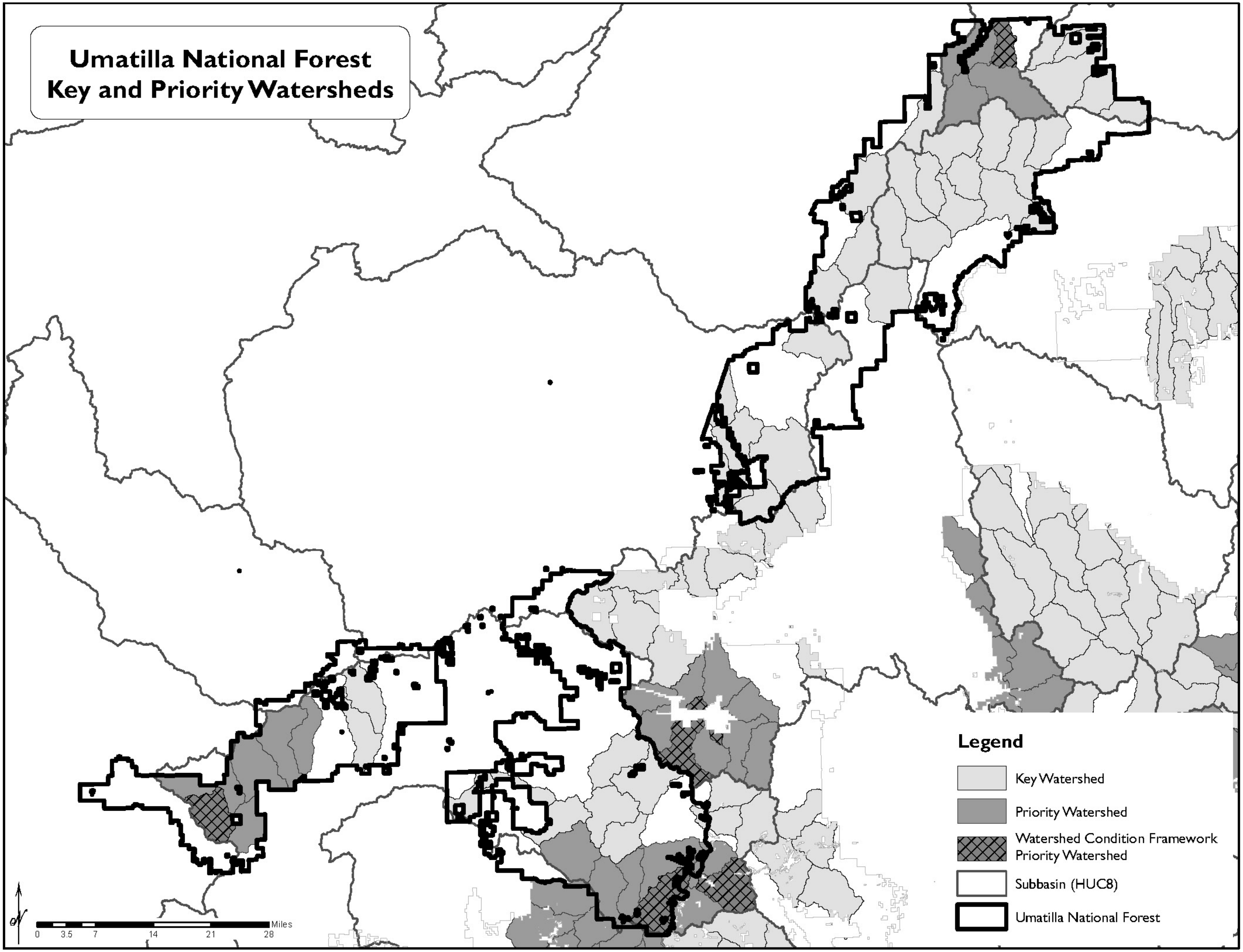

Umatilla National Forest
Suitability for Timber Production
Legend
Lands suitable for timber production
Other lands unsuitable for timber production but available for timber harvest
Lands generally not suitable for timber production or harvest
Forest Boundary
Miles
0 3.5 7 14 21 28
N

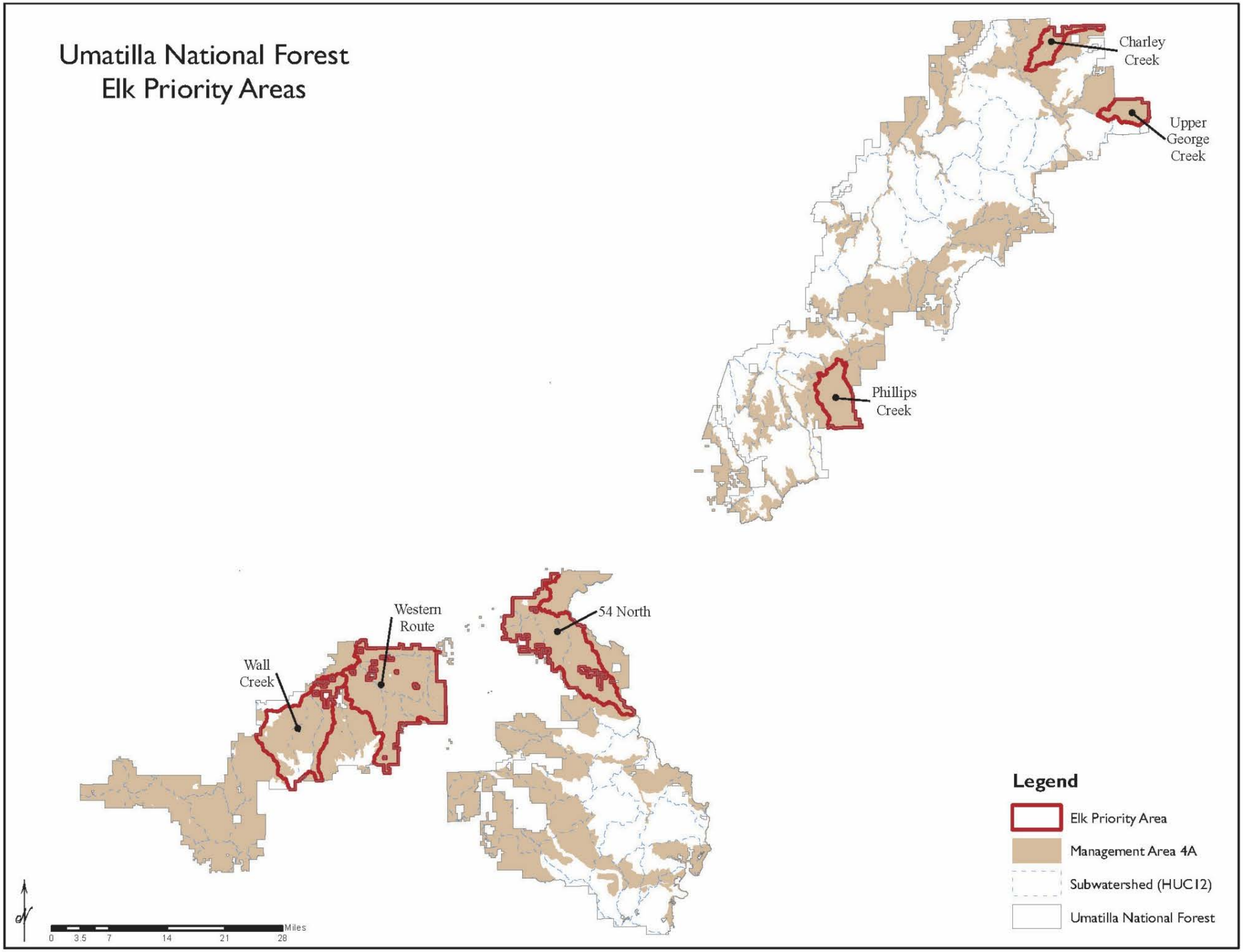


Umatilla National Forest
General Suitability for Cattle Grazing
Legend
Generally Suitable
Generally Unsuitable
Active Allotment
Closed or Non-Allotment
Active Sheep Allotment
*Allotment status as of 2013
N
0 3.5 7 14 21 28
Miles

Umatilla National Forest
General Suitability for Sheep Grazing




Umatilla National Forest
Key and Priority Watersheds
Legend
Key Watershed
Priority Watershed
Watershed Condition Framework Priority Watershed
Subbasin (HUC8)
Umatilla National Forest
Miles
0 3.5 7 14 21 28



Umatilla National Forest
Elk Priority Areas
Charley Creek
Upper George Creek
Phillips Creek
Western Route
54 North
Wall Creek
Legend
Elk Priority Area
Management Area 4A
Subwatershed (HUC12)
Umatilla National Forest
0 3.5 7 14 21 28 Miles
N